

ILLUSTRATIONS



OF ZOOLOGY



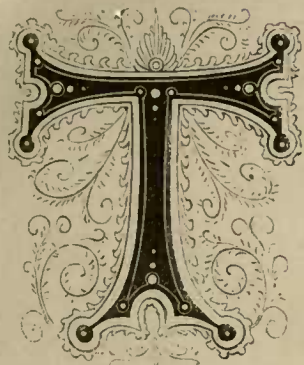


THE LIBRARY
OF
THE UNIVERSITY
OF CALIFORNIA

PRESENTED BY
PROF. CHARLES A. KOFOID AND
MRS. PRUDENCE W. KOFOID

ILLUSTRATIONS OF ZOOLOGY.

ADVERTISEMENT.



THE Engravings of objects of Natural History contained in the Encyclopædia Metropolitana have long been held in esteem for their beauty and accuracy. They were accompanied by articles of great scientific value, contributed by those eminent Naturalists, JOHN FLINT SOUTH, Esq., F.L.S., J. E. GRAY, Esq., F.L.S., and J. F. STEPHENS, Esq., F.L.S., F.Z.S.

The plan, however, on which the first edition of the Encyclopædia was arranged, was such as to scatter the descriptive details of Natural History inconveniently through twelve quarto volumes of Lexicography. Consequently, when the present Proprietors endeavoured to meet the wishes of the Public by dividing the Encyclopædia into separate subjects, they were unable to associate the Descriptions of Animals with the Engravings to which they related.

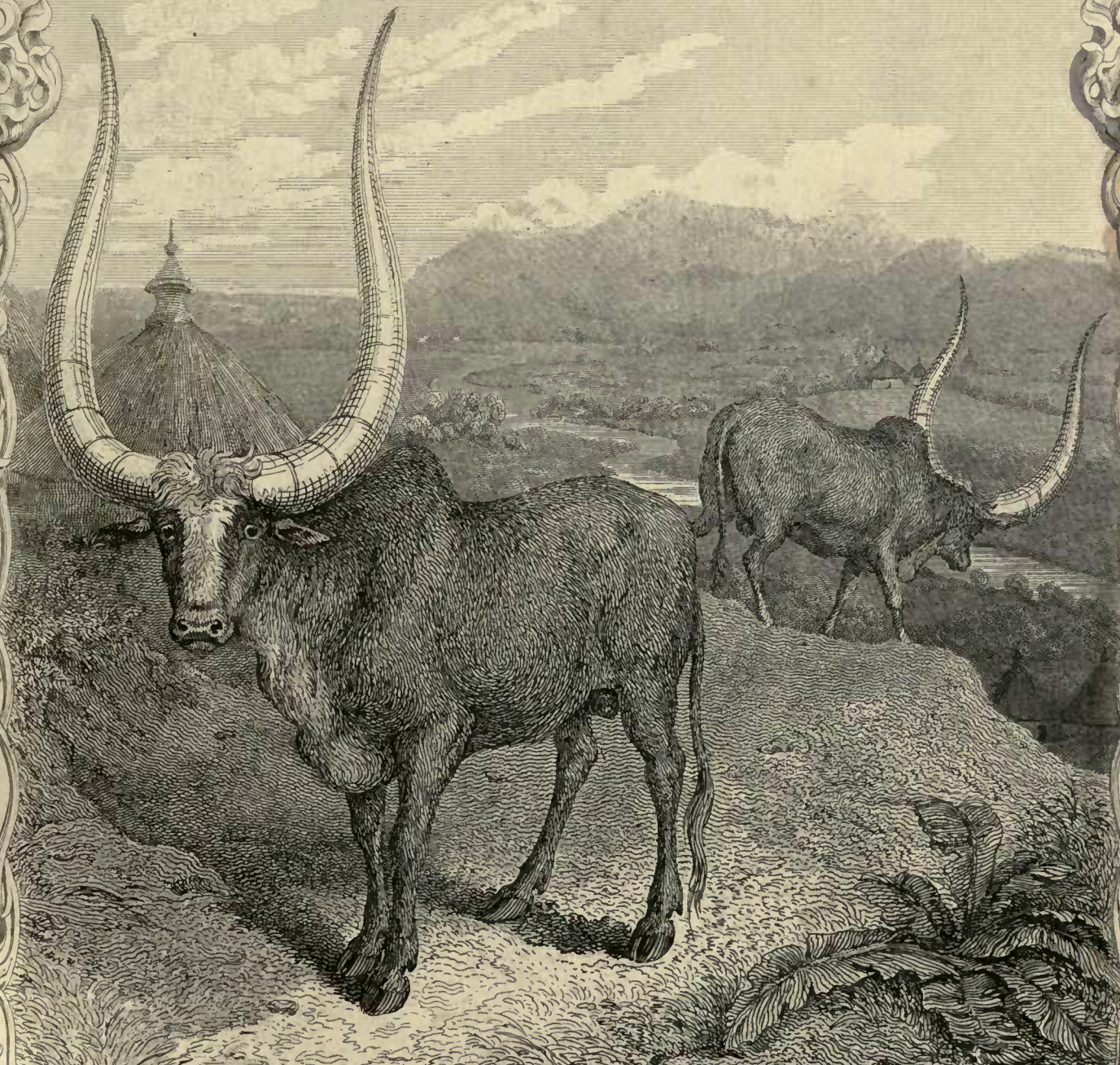
In order in some measure to remedy this defect, and to meet the existing demand for the Zoological Illustrations, the Proprietors instructed the Editor of this Volume to prepare, from the Contributions above referred to, and from the recent works of other eminent Naturalists, such an account of the Animals depicted in the Engravings as would convey useful and agreeable knowledge of them individually, and afford a systematic view of the Genera, Orders, and Classes to which they belong, and of which they constitute the characteristic Types.

That commission he has endeavoured to fulfil in the pages now submitted for public acceptance. He wishes it to be understood, however, that the work does not pretend to be a System of Zoology, though the information given in it is placed in systematic order; neither does it pretend to describe the Animal Kingdom with any degree of completeness, though it embraces, not merely the animals depicted in the Engravings, but many others that modern science has distinguished as forming the boundaries of particular departments of animal life.

What he trusts the work will be found to do, is to give a distinct view of the great Outlines of Zoology—to discriminate the peculiarities of its Divisions—and to exhibit the characteristics of those remarkable creatures which, in their several departments, most forcibly arrest the attention of those engaged in the study of the works of Nature.

London, January 1851.

ILLUSTRATIONS OF ZOOLOGY



Engraved by
Thomas Sanderson.

JOHN J. GRIFFIN & CO. LONDON.
RICHARD GRIFFIN & CO. GLASGOW.

1851.

ILLUSTRATIONS OF ZOOLOGY.

The Engravings by J. W. Lowry and Thomas Landseer,

FROM

Original Drawings by Sowerby, Yarley, Dalmei, Bone, Dyne, Lowry, and Charles Landseer ;

WITH DESCRIPTIVE LETTER-PRESS

EMBRACING

A Systematic View of the Animal Kingdom,

ACCORDING TO CUVIER.

WITH

CHARACTERISTIC ANECDOTES AND NARRATIVES SELECTED FROM THE WORKS OF RECENT NATURALISTS.



LONDON :

PUBLISHED BY JOHN JOSEPH GRIFFIN AND CO.,

53 BAKER STREET, PORTMAN SQUARE; AND

RICHARD GRIFFIN AND CO., GLASGOW.

1851.

CONTENTS.

VERTEBRATE ANIMALS.

CLASS I.—MAMMALIA.	
	Page
ORDER I.—QUADRU MANA; FOUR-HANDED	1—9
Simiada, <i>Monkeys</i>	1
Lemuridæ, <i>Lemurs</i>	7
ORDER II.—CHEIROPTERA; WING-HANDED	9—14
Galeopithecus, <i>Cat-like Monkey</i>	9
Fructivora, <i>Fruit-eating Bats</i>	10, 11
Leafless-nosed Bats	10, 12
Leaf-nosed Bats	10, 12
ORDER III.—SARCOPHAGA; PREYERS	15—31
Insectivora, <i>Insect-eaters</i>	15
Plantigrada, <i>Sole-treaders</i>	18
Digitigrada, <i>Toe-treaders</i>	21
Pinnata, <i>Fin-footed</i>	29
ORDER IV.—MARSUPIALA; POUCH-BEARERS	31—35
Carnivora, <i>Flesh-eaters</i>	31
Insectivora, <i>Insect-eaters</i>	31
Frugivora, <i>Fruit-eaters</i>	32
Fodienta, <i>Burrowers</i>	33
Salienta, <i>Leapers</i>	34
ORDER V.—RODENTIA; GNAWERS	35—41
Claviculata, <i>with perfect collar-bones</i>	35
Hemiclaviculata, <i>with imperfect collar-bones</i>	39
ORDER VI.—EDENTATA; TOOTHLESS	42—44
Tardigrada, <i>Slow-movers</i>	42
Cingulata, <i>Banded</i>	42
Myrmecophagida, <i>Ant-eaters</i>	42
ORDER VII.—PACHYDERMATA; THICK-SKINS	44—49
Proboscifera, <i>Trunked</i>	44
Eproboscifera, <i>Trunkless</i>	47
Solipeda, <i>Single-toed</i>	49
ORDER VIII.—RUMINANTIA; CUD-CHEWERS	49—55
Cameloida, <i>Camel-like</i>	49
Solidicornia, <i>Solid-horned</i>	50
Cavicornia, <i>Hollow-horned</i>	51
ORDER IX.—CETACEA; WHALES	55—57
Herbivora, <i>Grazers</i>	55
Spiracularia, <i>Spouters</i>	55
CLASS II.—AVES.	
ORDER I.—ACCIPETRES; PREYERS	58—63
Diurna, <i>Day Birds</i>	58
Nocturna, <i>Night Birds</i>	61

	Page
ORDER II.—PASSERINA; PERCHERS	63—73
Dentirostrata, <i>Tooth-billed</i>	63
Fissirostrata, <i>Wide-mouthed</i>	67
Conirostrata, <i>Cone-beaked</i>	68
Tennirostrata, <i>Slender-beaked</i>	71
Syndactyla, <i>Toe-tied</i>	72
ORDER III.—SCANSORI; CLIMBERS	73—77
Zygodactyla, <i>Yoke-tied</i>	73
Psittacida, <i>Parrots</i>	76
ORDER IV.—GALLINACEA; SCRATCHERS	77—82
Gallinida, <i>Poultry</i>	77
Columbida, <i>Pigeons</i>	81
ORDER V.—GRALLATORIA; WADERS	82—91
Brevipennata, <i>Short-winged</i>	82
Pressirostrata, <i>Flat-beaked</i>	83
Culirostrata, <i>Knife-beaked</i>	85
Longirostrata, <i>Long-beaked</i>	87
Macroactyla, <i>Long-toed</i>	89
ORDER VI.—PALMIPEDA; WEB-FOOTED	91—97
Brachyptera, <i>Short-winged</i>	91
Longipennata, <i>Long-winged</i>	93
Steganopoda, <i>Splay-footed</i>	94
Lamellirostrata, <i>Plaited-billed</i>	96

CLASS III.—REPTILIA.

	Page
ORDER I.—CHELONIA; TURTLES	98, 99
Chelonia, <i>Tortoise</i>	98
ORDER II.—CHAMPSIA; CROCODILES	99, 100
Crocodilia, <i>Crocodiles</i>	99
ORDER III.—SAURIA; LIZARDS	100—103
Lacertida, <i>Lizard-like</i>	100
Iguanida, <i>Iguanas</i>	101
Geckotida, <i>Geckos</i>	102
Chamaeleonida, <i>Chameleons</i>	102
Scincoida, <i>Scinks</i>	102
ORDER IV.—OPHIDIA; SERPENTS	103—106
Anguiformia, <i>Snake-like</i>	103
Snakes	103
Serpents	104
Poisonous Snakea	105
ORDER V.—BATRACHIA; FROGS	106—109
Ecaudata, <i>Tailless</i>	106
Caudata, <i>Tailed</i>	108

CLASS IV.—PISCES.

	Page
SUB-CLASS—BONY FISHES	110—124
ORDER I.—ACANTHOPTERYGIA; SPINE-FINNED	110—117
Percoida, <i>Perch</i>	110
Trigluida, <i>Gurnals</i>	110
Scianida, <i>Maigres</i>	110
Sparoida, <i>Bream</i>	112
Mænoida, <i>Cockerell, &c.</i>	112
Squamipennata, <i>Scaly-fins</i>	112
Scomberoida, <i>Macharels</i>	113
Tænoida, <i>Band-fish</i>	113
Theutida, <i>Theutyes</i>	113
Labyrinthiformia, <i>Cellular-gills</i>	115
Mugiloida, <i>Mullets</i>	115
Gobioida, <i>Gobies</i>	115
Pectoralipeda, <i>Anglers</i>	116
Labroida, <i>Wrasses</i>	116
Aulostomata, <i>Pipe-fish</i>	116
ORDER II.—HETRO-MALACOPTERYGIA; ABDOMINAL SOFT-FINS	117—120
Cyprinoida, <i>Carps</i>	117
Esocida, <i>Pikes</i>	117
Siluroida, <i>Sheet-fish</i>	117
Salmonida, <i>Salmons</i>	119
Clupeoida, <i>Herrings</i>	119
ORDER III.—LEMO-MALACOPTERYGIA; THROAT SOFT-FINS	120—122
Gadoida, <i>Cod-fish</i>	120
Pleuronectoida, <i>Flat-fish</i>	120
Discobolida, <i>Suckers</i>	120
ORDER IV.—APODO-MALACOPTERYGIA; WITHOUT VENTRAL FINS	122, 123
Anguilliformes, <i>Snake-like fishes</i>	122
ORDER V.—LOPHOBRANCHIATA; HOOP-GILLS	123
ORDER VI.—PLECTOGNATHI; FIXED JAWS	124
Gymnodonta, <i>Naked-teeth</i>	124
Sclerodermata, <i>Hard-skins</i>	124
SUB-CLASS—CHONDROPTERYGII; CARTILAGINOUS FISHES	124
ORDER—ELEUTHEROBRANCHIATA; LOOSE-GILLS	124
Sturionida, <i>Sturgeons</i>	125
ORDER—PYCNOBRANCHIATA; CLOSE-GILLS	125
Plagiostomata, <i>Transverse mouths</i>	125
Lampreys, <i>Round mouths</i>	125

INVERTEBRATE ANIMALS.

CLASS V.—MOLLUSCA.	
	Page
SUB-CLASS.—CEPHALOPODA; HEAD-WALKERS	127—130
Order: OCTOPODA, <i>Having eight feet</i>	127
Order: FORAMINIFERA, <i>Full of holes</i>	129
SUB-CLASS.—GASTEROPODA, BELLY-WALKERS,	130—135
Order: PULMONIFERA, <i>Air-breathers</i>	130
Order: GYMNOBRANCHIATA, <i>Naked-gills</i>	131
Order: TECTIBRANCHIATA, <i>Covered-gills</i>	132
Order: PECTINIBRANCHIATA, <i>Comb-gills</i>	134
Tricoid Tribe	134
Buccinoid Tribe	135
Capuloid Tribe	135
SUB-CLASS.—ACEPHALA, HEADLESS	135, 137
Order: HETEROBRANCHIATA	136
SUB-CLASS.—CIRRHOPODA	137—139
Order: PEDUNCULAR, <i>Camptosomata</i>	127
Order: SESSILE, <i>Acamptosomata</i>	138
CLASS VI.—INSECTA.	
Order: COLEOPTERA, <i>Sheath-winged</i>	138, 141
Order: ORTHOPTERA, <i>Straight-winged</i>	139, 143
Order: NEUROPTERA, <i>Lace-winged</i>	139, 143

	Page
Order: TRICHOPTERA, <i>Hairy-winged</i>	143
Order: HYMENOPTERA, <i>Membranous-winged</i>	139, 143
Order: LEPIDOPTERA, <i>Feather-winged</i>	140, 144
Order: HEMIPTERA, <i>Half-winged</i>	140, 144
Order: DIPTERA, <i>Two-winged</i>	141, 144
Order: APTEA, <i>Wingless</i>	141
Order: HOMOPTERA, <i>Roof-like wings</i>	145
Order: STREPSITERA, <i>Twisted-winged</i>	145
CLASS VII.—CRUSTACEA.	
Order: BRACHYURA, <i>Short-tails</i>	146
Order: MACROURA, <i>Long-tails</i>	146
Order: STOMAPODA, <i>Footed-mouths</i>	146
Order: ISOPODA, <i>Equal-legs</i>	146
Order: BRANCHIOPODA, <i>Footed-gills</i>	146
CLASS VIII.—ARACHNIDA.	
Order: THYSANOURA, <i>Fringed-tails</i>	147
Order: ARANEIDA, <i>Spiders</i>	147
Order: CHELIFERA, <i>Scorpions</i>	147
Order: ACARIDA, <i>Mites</i>	147
CLASS IX.—MYRIAPODA	148

	Page
CLASS X.—ANNELIDA	148
CLASS XI.—ECHINODERMATA; SPINED-SKINS	
Order: ECHINOIDA, <i>Sea-urchins</i>	149
Family: Cidaroid	149
Family: Echinoid	149
Family: Scutelloid	149
Family: Galeritidans	149
Family: Spatangoid	149
Order: STELLERIDA	150
Order: HOLOTHURIA	150
CLASS XII.—ENTOZOA	151
CLASS XIII.—ACALEPHA	151
Order: CTENOPHORA, <i>Crest-bearers</i>	151
Order: SCIAPHORA, <i>Umbrella-bearers</i>	151
Order: SIPHONOPHORA, <i>Siphon-bearers</i>	152
CLASS XIV.—INFUSORIA	152
CLASS XV.—POLYPS	153
CLASS XVI.—SPONGIA	156

LIST OF ILLUSTRATIONS.

FIRST DIVISION.

VERTEBRATE ANIMALS.

CLASS I.—MAMMALIA.

ORDER I.—QUADRU MANA.

PLATE I.

Ourang Outang.
 Lotong.
 Proboscis Monkey.
 Great Baboon.

PLATE II.

Red Monkey.
 Horned Monkey.
 Squirrel Monkey.
 Four-fingered Monkey.
 Striated Monkey.
 Silky Monkey.

PLATE III.

Ring-tailed Macauco.
 Short-tailed Indri.
 Bengal Lori.
 Senegal Galago.
 Daubenton's Tarsier.
Tarsius Bucanus.

Wood Engravings:

Chimpanzee, p. 2.
 Sapajou, p. 5.
 Macauco, p. 8.
 Head of Macauco, p. 8.

ORDER II.—CHEIROPTERA.

PLATE IV.

Java Rousette.
 Swift Molasse.
 Spectre Bat.

Wood Engraving:

Bat Walking, p. 14.

ORDER III.—SARCOPHAGA.

PLATE IV.

Common Hedgehog.
 Common Shrew.
 Common Mole.

Wood Engravings:

Teeth of Insectivorous Animals, p. 16.
 Nest of Mygale, p. 18.
 Desman, p. 18.

PLATE V.

Polar Bear.
 Raccoon.
 Brown Coati.
 Wolverine.

PLATE VI.

Pine Martin.
 American Skunk.
 Common Otter.
 Civet.
 Egyptian Ichneumon.

PLATE VII.

Thibet Dog.
 Wolf.
 Jackal.
 Fox.
 Fennek.

PLATE VIII.

Striped Hyena.
 Lion.
 Tiger.

Wood Engraving:

Panther, p. 29.

PLATE IX.

Common Seal.
 Black Otary or Seal.
 Walrus.

Wood Engraving:

Seal, p. 29.

ORDER IV.—MARSUPIALA.

PLATE X.

Mange's Dasyure.
 Virginian Opossum.
 Porcine Bandicoot, or Peramele.
 Mouse-like Phalanger.

PLATE XI.

Wombat.
 Potoroo.
 Great Kangaroo.

Wood Engravings:

Kangaroo, p. 34.
 Skeleton of Kangaroo, p. 34.

ORDER V.—RODENTIA.

PLATE XII.

Lemming.
 Dormouse.
 Common Beaver.
 Molina's Coypu.
 Black Rat.
 Egyptian Jerboa.

Wood Engravings:

Teeth of Rodentia, p. 35.
 Molar teeth of Beaver, p. 35.

PLATE XIII.

Cape Jerboa.
 Alpine Marmot.
 Common Hare.
 Calling Hare.
 Great Flying Squirrel.
 Common Porcupine.

Wood Engraving:

Squirrel, p. 39.

ORDER VI.—EDENTATA.

PLATE XIV.

Ai, or Three-toed Sloth.
 Nine-banded Armadillo.
 Great Ant-eater.
 Long-tailed Pangolin.
 Spiny Echidna.
 Rufous Ornithorhynque.

Wood Engravings:

Head of Armadillo, p. 42.
 Ornithorhynchus, p. 44.

ORDER VII.—PACHYDERMATA.

PLATE XV.

Indian Elephant.
 Giant Mastodon.

PLATE XVI.

Indian Rhinoceros.
 American Tapir.
 Hippopotamus.

Wood Engravings:

Head of Tapir, p. 47.
 Boar's head, p. 47.

PLATE XVII.

Horse.
 Ass.
 Zebra.

ORDER VIII.—RUMINANTIA.

PLATE XVIII.

Dromedary.
 Llama.
 Java Musk.

PLATE XIX.

Elk or Deer.
 Rein-deer.
 Roebuck.
 Giraffe or Camelopard.

PLATE XX.

Common Antelope.
 Egyptian Antelope.
 Royal Antelope.
 White-footed Antelope.
 Gnu.

PLATE XXI.

Ibex Goat.
 Wild Sheep.
 Rocky Mountain Sheep.
 Bison.

ORDER IX.—CETACEA.

PLATE XXII.

American Manatee.
 Dugong.
 Steller's Rytina.

PLATE XXIII.

Common Dolphin.
 Narwhal.
 Cachalot or Spermaceti Whale.
 Common Greenland or Whalebone Whale.

CLASS II.—AVES.

ORDER I.—ACCIPETRES.

PLATE I.

Monk Vulture.
 King Vulture.
 Egyptian Vulture.
 Alpine Gypaete.

Wood Engraving:

Griffin Vulture, p. 59.

PLATE II.

Peregrine Falcon.
 Booted Buzzard.
 Sea Eagle.
 Cape Snake-eater.

Wood Engravings:

Gypaetes, p. 60.
 Head of Falcon, p. 60.
 Kite, p. 61.
 Eagle and Serpent, p. 156.

PLATE III.

Snowy Harfang, or Owl.
 Brown Owl.
 White Owl.
 Long-eared Owl.

ORDER II.—PASSERINA.

PLATE IV.

Great Cinereous Shrike or Butcher-bird.
 Spotted Fly-catcher.
 Banded Tanager.
 Mocking-bird.
 Orange Rock-cock.

PLATE V.

Chimney Swallow.
 House Martin.
 Esculent Swallow.
 Black Swift.
 European Goat-sucker.
 Leona Goat-sucker.

Wood Engraving:

Bird of Paradise, p. 69.

PLATE VI.

Nuthatch.
Xenops Rutilans.
 Common Creeper.
 Wall Creeper.
 Delalandi's Humming-bird.
 Hoopoe.
 Common Bee-eater.
 Kingfisher.

ORDER III.—SCANSORES.

PLATE VII.

Long-tailed Jacamar.
 Great Jacamar.
 Great Black Woodpecker.
 Three-toed Woodpecker.
 Wryneck.
 Smaller Picus.

PLATE VIII.

Scarlet Maccaw.
 Angola-yellow Parrakeet.
 Bonneted Psittacule.
 Grey Parrot.
 Long-nosed Cockatoo.
 Grey Small-tongued Parrot.

ORDER IV.—GALLINACEA.

PLATE IX.

Sonnerat's Cock.
 Crested Cock.
 Amherst's Pheasant.
 Silver Pheasant.
 Nepal Horned Pheasant.
Cryptonyx Coronatus.

PLATE X.

Carunculated Pigeon.
 Crown-bird or Crowned Pigeon.
 Stock-dove.
 White-headed Pigeon.
 Abyssinian Pigeon.
 Bald-fronted Pigeon.

ORDER V.—GRALLATORIA.

PLATE XI.

Ostrich.
 Nandu.
 Cassowary.
 Emeu.

PLATE XII.

Great Bustard.
 Common Thick-knee.
 Golden Plover.
 Grey Sand-piper.
 Pied Oyster-catcher.
 Bronze-winged Cnrsr.
 Margrave's Cariama.

PLATE XIII.

Boat-bill.
 Common Heron.
 Great Egret.
 Bittern.

PLATE XIV.

White Stork.
 Senegal Jabiru.
 Tufted Umbre.
 Coromandel Erody.
 Milky Tantalus.
 Roseate Spoonbill.

PLATE XV.

Chinese Jacana.
 Horned Screamer.
 Freycinet's Mankiro.
 Sultana-bird.
 White Shenthbill.
 Red Flamingo.
 Collared Pratincole.

ORDER VI.—PALMIPEDA.

PLATE XVI.

Horned Grebe.
 Senegal Coot-grebe.
 Northern Diver.
 Puffin.
 Great Auk.
 Patagonian Pengnin.

LIST OF ILLUSTRATIONS.

PLATE XVII.

Hartie's Petrel.
Berard's Haladrome.
Broad-billed Prion.
Wandering Albatross.
Black-backed Gull.
Black Skimmer.

PLATE XVIII.

Common Pelican.
Cormorant.
Great Frigate-bird.
White Gannet.
Le Vaillant's Darter.
Red-tailed Tropic-bird.

PLATE XIX.

Wild Swan.
Wild Goose.
New Holland Pigeon-goose.
Shoveller.
Lobated Duck.
Goosander.

CLASS III.—REPTILIA.

ORDER I.—CHELONIA.

PLATE I.

Common Tortoise.
Written Fresh-water Tortoise.
Three-striped Box Tortoise.
Striped Turtle.
Matamoras.
Nilotic Trionyx or Soft Tortoise.

Wood Engravings:

Under surface of Tortoise, p. 98.
Skeleton of Tortoise, p. 99.

ORDER II.—CHAMPSIA.

PLATE II.

Indian Crocodile.
Nilotic Crocodile.
Spectacle Alligator.

ORDER III.—SAURIA.

PLATE III.

Nilotic Ouaran.
Eyed Lizard.
Common Stellion.
Striped Dragon.
Common Guana.
Cape Anolis.

Wood Engravings:

Dragon, p. 101.
Iguana, p. 101.

PLATE IV.

Egyptian Gecko.
Common Chameleon.
Official Scink.
Three-toed Seps.
Scaly-footed Biped.
Chirotes Propus.

Wood Engravings:

Gecko, p. 102.
Chameleon, p. 103.

ORDER IV.—OPHIDIA.

PLATE V.

Pseudopus Pallasii.
Amphisbana Alba.
Tortrix Scytale.
Boa Constrictor.
Python Poda.
Java Oularcaron.

PLATE VI.

Banded Rattle-snake.
Vipera Berus.
Cerastes Husselquistii.
Yellowish Hooded Snake.
Trimeresurus Microcephalus.
Bicoloured Sea-serpent.
Pseudo-boa.
Cecilia Glutinosa.

ORDER V.—BATRACHIA.

PLATE VII.

Edible Frog.
Horned Frog.
Tree Frog.
Common Toad.
Yellow-bellied Toad.
Surinam Pipa.

Wood Engravings:

Skeleton of Frog, p. 107.
Tadpole, in successive states, p. 107.

PLATE VIII.

Spotted Salamander.
Marbled Newt or Eft.
Menopome or Hellbender.
Axolotl.
Snake-like Protens.
Lizard-like Siren.

Wood Engravings:

Salamander, p. 108.
Axolotl, p. 109.

CLASS IV.—PISCES.

ORDER I.—ACANTHOPTERYGIA.

PLATE I.

Perch.
Common Weever.
Smaller Red-beard.
Red Gurnard.
Dactylopterus.
Sciaena Umbra.
Saddle-fish.

Wood Engraving:

Skeleton of Perch, p. 110.

PLATE II.

Ringed Sparus.
Sea Rough.
Cockerell.
Pickarell.
Streaked Chetodon.
Brama Atropus.

PLATE III.

Mackerel.
Sword-fish.
Dorec.
Hairtail.
Stylephorus.
Chordatus.
Red Band-fish.

Wood Engravings:

Sword-fish, p. 114.
Tunny, p. 114.

PLATE IV.

Climbing Perch.
Dotted Snake-head.
Mullet.
Butterfly-fish.
Wolf-fish.
Black Goby.

Wood Engraving:

Respiratory organs of Anabas, p. 115.

PLATE V.

Common Angler.
Surinam Toad-fish.
Red Wrasse.
Cretan Scarus.
Tobacco-pipe Fish.
Sea Woodcock.

ORDER II.

HETROMALACOPTERYGIA.

PLATE VI.

Carp.
Muddy Loach.
Four-eye.
Pike.
Flying-fish.
Sheet-fish.
Pimelodes Cyclopus.
Loricaria Cirrhosa.

Wood Engravings:

Dorsal Fin, p. 118.
Pike, p. 118.
Malapterus, p. 118.

PLATE VII.

Salmon.
Argentine.
Fetid Saury.
Herring.
Gnathobolus Aculeatus.
Porypterus Bichir.

ORDER III.

LEMOMALACOPTERYGIA.

PLATE VIII.

Codfish.
Mediterranean Fork-beard.
Plaice.
Whiff.
Sole.
Cornish Sucker.
Common Remora.

Wood Engravings:

Plaice, p. 124.
Turbot, p. 124.
Remora, p. 122.
Disc of Remora, p. 122.

ORDER IV.

APODO-MALACOPTERYGIA.

PLATE IX.

Sharp-nosed Eel.
Conger.
Glassy Ophisure.
Murana Meleagris.
Sphagebranchus Rostratus.
Saccopharynx Harwoodii.
Banded Gymnote.
Anglesea Morris.
Beardless Ophidium.
Sand-lance.

Wood Engraving:

Gymnotus, p. 123.

ORDER V.—LOPHOBRANCHIATA.

PLATE X.

Needle-fish.
Sea Dragon.
Round Diodon.
Oblong Sun-fish.
Mediterranean File-fish.
Trunk-fish.

Wood Engraving:

Globe-fish, p. 124.

SUB-CLASS.

CHONDROPTERYGII.

ORDER.—ELEUTHEROBRANCHIATA.

PLATE XI.

Sturgeon.
Sterlet.
Northern Chimæra, or King of the Herrings.
Southern Chimæra, or Elephant Fish.

Wood Engraving:

Sturgeon, p. 125.

ORDER.—PYCNOBRANCHIATA.

PLATE XII.

White Shark.
Angel-fish.
Spotted Torpedo.
Rough Ray.
Sea Lamprey.
Myxine or Hog.

Wood Engravings:

Shark, p. 126.
Head of Shark, p. 126.
Torpedo, p. 126.
Raia, p. 126.
Lamprey, p. 126.
Mouth of Lamprey, p. 126.

SECOND DIVISION.

INVERTEBRATE ANIMALS.

CLASS V.—MOLLUSCA.

SUB-CLASS.—CEPHALOPODA.

PLATE I.

Argonauta raricosta.
— argo.

Wood Engravings:

Paper Nautilus, p. 128.
Loligopsis, p. 128.
Pearly Nautilus, p. 128.
Ammonite, p. 129.
Octopus or Poulp, p. 129.
Calamary, p. 129.

ORDER.—FORAMINIFERA.

PLATE II.

Nodosaria lavigata.
Marginulina Raphanus.
Pavonia flabelliformis.
Textularia aciculata.
Polymorphina communia.
Balimina marginata.
Ungerina pygmaea.
Rosalina globularia.
Truncatulina refulgens.
Planulina Araminensis.
Dendritina arbuscula.
Nouionina umbilicata.
Biloculina bulloides.
Triloculina trigoluna.

Quinqueloculina saxorum.
Amphigistina Quoyii.
Heterogystina depressa.
Fabularia discolithes.

SUB-CLASS.—GASTEROPODA.

ORDER.—PULMONIFERA.

PLATE III.

Limax maximus vel antiquorum.
— variegatus.
Testacella Maugei.
Helix naticoides.
— Japonica.
— algera.
— carocolla.
— nux denticulata.

Helix albella.
— epistyllium.
Bulimus ovatus.
Pupa.
Clausilia.
Achatina virginea.
Physa rivalis.

ORDER.—GYMNOBRANCHIATA seu
NUDIBRANCHIATA.

PLATE IV.

Doris trilobata.
— lacinata.
— nodosa.
— pennigera.
— limbata.

Doris tuberculata,
— cornuta.
— atro-marginata.
Onchidorus Leachi.
Peronia Mauritania.
Polycera quadricornis.
Tritonia Homborgii.
Thethys leporina.
Scyllaea pelagica.
Glaucus Atlanticus.
Laniogerus Efortii.
Eolidia Cuvieri.
Cavolina perigrina.
Eolis tergipes.

Wood Engraving:

Eolis, p. 132.

ORDER.—TECTIBRANCHIATA.

PLATE V.

Pleurobranchus Peronii.
Lamellaria membranacea.
Aplysia punctata.
Dolabella Rumphii.
Notarchus Cuvieri.
Acera carnosa.
Bullaea aperta.
Bulla lignaria.
Bullina Gnanensis.
Umbella Indica.

ORDER.—PECTINIBRANCHIATA.

PLATE VI.

Trochoid Tribe.

Monodonta (animal of).
Trochus Henslovii.
— Emma.
Imperator.
Paludina fasciata.
— costata.
Littorina littoralis.
Phasianella bulimoides.
Ampullaria solida.
Melania Bironensis.
Natica millepunctata.
Nerita undulosa.
— cariosa.
Neritina Owenii.

Buccinoid Tribe.

Cerithium Lamarckii.
— fuscatum.
— telescopium (opercule of).

Wood Engraving:

Paludina, p. 134.

PLATE VII.

Capuloid Tribe.

Capulus Hungaricus.
Pileopsis mitrula.
— crenulata.
Hipponix cornucopiae.
Disputea Bironensis.
Crepidula porcellana.
— Peruviana.
— unguis.
Calyptraea Neptuna.
Siphonaria radiata.
— gigas.
Gadinia.
Sigaretus halotideus.
Coriocella nigra.

Wood Engraving:

Hyalea, p. 135.

SUB-CLASS.—ACEPHALA.

PLATE VIII.

ORDER.—HETEROBRANCHIATA.

Cynthia momus.
— canopus.
Botryllus polycyclus.
Polyclinum constellatum.
Sigillina Australis.
Distoma rubium.
Sinoicum turgens.

SUB-CLASS.—CIRRHOPODA.

PLATE IX.

ORDER.

PEDUNCULAR (CAMPTOSOMATA).

Pentalasmis vulgaris.
Cineras vittata.
Otion Cuvieri.
Scalpellum vulgare.
Polliceps cornucopiae.

ORDER.

SESSILE (ACAMPTOSOMATA).

Tubicinella Lamarckii.
Coronula Diadema.
Chelonobia Savignii.
Pyrgoma cancellata.
Crensia Spinulosa.
Acasta Montagui.
Balanus tintinnabulum.
Balanus.
Conia vulgaris.
Clisia verruca.

Wood Engraving:

Balanus, p. 138.

TERMS USED IN CONCHOLOGY.

PLATE X.

Symmetrical Univalves.
Serial Multivalves.
Coronal Multivalves.
Bivalve shells.
Lamplike Shells.

PLATE XI.

Spiral Shells.
Sub-spiral Shells.
Opercula of Shells.

CLASS VI.—INSECTS.

Illustrations of Lamarck's Arrangement
of Insects.

PLATE I.

ORDER I.—COLEOPTERA.

Lucanus Cervus.
Lampyrus noctiluca (male 2, female 3).
Cerambyx.

ORDER II.—ORTHOPTERA.

Gryllotalpa vulgaris.
Blatta Lapponica.
Forficula vulgaris.
Gryllus cæruleus.
Mantis striata.

ORDER III.—NEUROPTERA.

Myrmeleo formicarius (in different stages).
Libellula depressa (larva of).
Nemoptera vulgaris.
Ascalaphus barbarus.

ORDER IV.—HYMENOPTERA.

Sphex spirifex.
Urocerus gigas.
Pompilus viaticus.

PLATE II.

ORDER V.—LEPIDOPTERA.

Lycæna dispar (in various stages).
Hesperia comma.
Noctua delphinula.
Bombyx dispar.
— furcula (in two states).

ORDER VI.—HEMIPTERA.

Fulgora candellaria.
Naucoris cimicoides.
Notonecta glauca.
Coccus cacti.
Aphis rose (in two states).

ORDER VII.—DIPTERA.

Echinomyia fera.
Hirtea pomona.
Cenogastra mystacinus.
Ceropterus tipuloides.
Thereva crassipennis.
Tabanus niger.
Diopsis Ichneumonea.

ORDER VIII.—APTERA.

Pulex irritans (male and female).
— penetrans (in different stages).

Illustrations of another Arrangement of
Insects; more in accordance with the
systems of recent Naturalists than the
preceding Arrangement.

PLATE III.

ORDER I.—COLEOPTEROUS INSECTS.

Anthia quadriguttata.
Elaphrus uliginosus.
Omophron limbatum.
Hydrous piceus.
Necrophorus vespillo.
Tachys minuta.
Passalus interruptus.
Chiasognathus Grantii.
Drilus flavescens.
Tillus mutilarius.
Enicopus niger.
Uleiota flavipes.
Callichroma alpina.
Molochus abbreviatus.
Rhagium mordax.
Ceroctoma Schoefferi.
Homalysus suturalis.
Notoxus monocerus.
Lomechusa dentata.

PLATE IV.

COLEOPTEROUS INSECTS—(continued).

Helophorus aquaticus.
Scaphidium quadrimaculatum.
Necrodes littoralis.
Anthicus pedestris.
Nitidula grisea.
Apathe capuzina.

ORDER II.

ORTHOPTEROUS INSECTS.

Tridactylus paradoxus.
Truxalis nasuta.
Acridium bipunctatum.

ORDER III.

NEUROPTEROUS INSECTS.

Lestes autumnalis.
Raphidia notata.
Ephemera vulgata.
Panorpa vulgaris.

ORDER IV.

TRICHOPTEROUS INSECTS.

Limnephilus griseus.

ORDER V.

HYMENOPTEROUS INSECTS.

Banchus pictus.
Evania appendigaster.
Scolia quadrimaculata.
Mutilla coccinea.
Ichneumon manifestator.
Pterygophorus cinctus.
Masaris apiformis.

PLATE V.

ORDER VI.

LEPIDOPTEROUS INSECTS.

Fidonia melanaria.
Earis clorana.
Crambus margaritellus.
Harpieteryx harpella (two states).
Adela sultzeana.

ORDER VII.—DIPTEROUS INSECTS.

Ceria conopsoides.
Henops marginatus.
Anthrax moria.

ORDER VIII.

HEMIPTEROUS INSECTS.

Tingis vinarum.
Lygæus militaris.
Tetyra nigrolineata.
Syrts paradoxus.
Berytus tipularis.
Hydrometra stagnarum.
Genis lacustris.

ORDER IX.

HOMOPTEROUS INSECTS.

Lystra lanuginosa.
Flata alba.
Delphax pellucidus.
— dorsatus.
Thrips cæruleocollis.

ORDER X.

STREPSIPTEROUS INSECTS.

Stylops mellittæ.
— Kirbii.
— Dalii.
Halictophagus Curtisii.
Elenchus Walkeri.
Xenos vesparum.

PLATE VI.

TERMS USED IN ENTOMOLOGY.

Antennæ.
Trophæ, &c.
Legs.
A. Coleopterous.
B. Strepsipterous.
C. Hymenopterous.
D. Lepidopterous.

CLASS VII.—CRUSTACEA.

PLATE.

ORDER I.—BRACHYURA.

Grapsus pictus.
Phyllosoma clavicornis.

ORDER II.—MACROURA.

Pagurus Bernardus.

ORDER III.—STOMAPODA.

Squilla mantis.

ORDER IV.—ISOPODA.

Cymodoce Lamarckii.
Porcellus asellus.

ORDER V.—BRANCHIOPODA.

Polyphemus stagnalis.
Daphnia pulex.
Lepidurus prolongus.
Brachypus stagnalis.

CLASS VIII.—ARACHNIDA.

PLATE.

ORDER I.—THYSANOURA.

Forbicina vittata.
Podura villosa.

ORDER II.—ARANEIDA.

Mygale avicularis.
Aranea extensa.
— lobata.

ORDER III.—CHELIFERA.

Scorpio rufescens.
Chelifer cancroides.

ORDER IV.—ACARIDA.

Smaridia fringillaris.
Siro rubens.

CLASS IX.—MYRIAPODA.

Polydesma complanata.
Lithobia vulgaris.
Glomeris zonatus.
Julus sabulosus.

Wood Engravings:

Julus, p. 148.
Scolopendra, p. 148.

CLASS X.—ANNELIDA.

Wood Engravings:

Leech, p. 148.
Group of *Serpulæ*, p. 149.
Nereis, p. 149.

CLASS XI.

ECHINODERMATA.

ORDER I.—ECHINOIDA.

PLATE I.

Family—CIDAROID.

Diadema fistularis.
Cidaris imperialis.
Astropyga radiata.

Family—ECHINOID.

Echinus miliaris.
— *elegans.*
— *sardicus.*
Echinometra mammillatus.

PLATE II.

Family—SCUTELLOID.

Echinanthus subdepressa.
Echinarachnius placenta.
Echinodiscus digitata.
Cassidulus Australis.

Family—GALERITIDANS.

Galerites albo-galeris.
Echinaneus minor.
Echinolampas Koenigii.
Echinocorys ovatus.
Echinobryssus Breynii.

Family—SPATANGOID.

Echinodardium Atropos.
Spatangus purpureus.
Brissus unicolor.

ORDER II.—STELLERIDA.

PLATE III.

Asterias pulchella.
— *cylindrica.*
Ophiura mutica.
— *Lamarckii.*
— *squamosa.*
— *lineolata.*
Euryale simplex.

ORDER III.—HOLOTHURIA.

Wood Engraving:

Holothuria, p. 150.

CLASS XII.—ACALEPHA.

PLATE.

ORDER I.—SIPHONOPHORA.

Diphya.
Rhizophysa planostoma.
Physophora disticha.
Physalia megalista.
Vellula cyanea.
Porpita gigantea.

ORDER II.—SCIAPHORA.

Berenice rosea.
Geryonia hexaphylla.
Pelagia panopyra.
Æquorea Forskaelena.
Aurelia aurita.
Rhizostoma Cuvieri.

ORDER III.—CTENOPHORA.

Beroe macrostoma.
Callionira triploptera.
Cestum Veneris.

CLASS XIII.—ENTOZOA.

Wood Engraving:

Tapeworm, p. 151.

CLASS XIV.—INFUSORIES.

SUB-CLASS—POLYGASTRICA.

PLATE I.

ORDER I.—ANENTEROUS.

Monas crepusculum.
— *guttula.*
Uvella virescens.

Doxococcus globulus.
Chilomonas volvox.
Bodo socialis.
Cryptomonas ovata.
Trachelomonas volvocina.
Gyges granulum.
Syncrepta volvox.
Sphaerosira volvox.
Volvox globata.
Vibrio subtilis.
Spirodiscus fulvus.
Closterium lunula.
Astasia hæmatodes.
Euglena viridis.
Distigma tenax.
Epipyxis utriculus.
Dinobryon sertularia.
Amæba diffuens.
Diffugia Proteiformis.
Cypidium aureolum.
Desmidiium Swarzii.
Xanthidium fasciculatum.
Micrasterias Boryana.
Euastrum aculeatum.
Navicula phenicentron.
Bacillaria vulgaris.
Isthmia enervis.
Syndera ulna.
Echinella splendida.
Syncyba salpa.
Naunema Dilwynii.
Schizonema Agbardi.
Cyclidium glaucoma.
Chætomonas constricta.
Chætophylla armata.
Chætoglena volvocina.
Peridinium tripos.
Glenodinium tabulatum.

ORDER II.—ENTERODELOUS.

Stentor Mulleri.
Urocentrum turbo.
Vorticella microstoma.
Zoothamnium arbuscula.
Ophrydium versatile.
Tintinnus inquilinus.
Vaginicola chrystallina.
Enchelys pupa.
Lachrymaria proteus.
Lencophrys patula.
Prorodon teres.
Coleps incurvus.
Trachelius ovum.
Phialina vermicularis.
Chilodon cucullus.
Trachelocera olor.
Aspidisca denticulata.
Amphileptus fasciola.

PLATE II.

ENTERODELOUS—(continued.)

Colpoda ren.
Ophryglæna acuminata.
Oxytricha cicada.
Stylonychia pustulata.
Discocephalus rotatorius.
Chlamidodon Mnemosyne.
Euplotes Charon.

SUB-CLASS.—ROTATORIES.

ORDER I.—MONOTROCHOUS.

Ptygura melicerta.
Ichthyidium podura.
Chættonotus maximus.
Glenophora trochus.
Ocistes hyalinus.
Cyphonautes compressus.
Microcodon clavus.
Tubicolaria najas.
Floscularia ornata.
Melicerta ringeus.
Lymnas ceratophylli.

ORDER II.—SOROTROCHOUS.

Hydatina trachydactyla.
Furcularia gibba.
Diglena grandis.
Triopthalmus dorsalis.
Cycloglena lupus.
Lepadella ovalis.
Euchlanis luna.
Colurus caudatus.
Squamella oblonga.
Callidina elegans.
Rotifer macrurus.
Philodina aculeata.
Noteus quadricornis.
Anurea squamula.
Brachionus amphicerus.
Pterodina patina.

CLASS XV.—POLYPS.

PLATE.

Cornicularia rugosa.
Tubipora musicalis.
Renilla Americana.
Tubularia elyptoidæa.
Corallium rubrum.
Gorgonia patula.
Millepora spongitis.
Bicellaria fastigiata.
Serialaria lengidera.
Cellepora hyalina.
Laomedea dichotoma.
Plumaria secundaria.
Sertularia pumila.
Caryophyllea solitaria.
Meandrina limosa.
Zoanthus Ellisii.
Astrea ananas.
Meandrina cerebriformis.
Oculina varicosa.
Actinia dianthus.

Wood Engravings:

Actinia, p. 155.
Veretillum, p. 155.
Hydra, p. 155.
Campanularia, p. 155.
Corallina, p. 155.
Plumatella, p. 155.

CLASS XVI.—SPONGIA.

Wood Engraving:

Spongia, p. 156.



ILLUSTRATIONS OF ZOOLOGY.

FIRST DIVISION.

VERTEBRATE ANIMALS.

The Vertebrate Animals are those whose special arrangement consists in a series of bones firmly connected, yet possessing freedom of motion—the several bones being moveable on one another. The term comes from the Latin *Vertebra*, “a joint in the back-bone;” and this from *Verto*, “I turn.”

CLASS I.—MAMMALIA.

The Mammalians are warm and red-blooded animals, they respire through lungs; and they all suckle their young, nourishing them by a milky secretion formed in the *Mammæ* (breasts or teats), hence the name Mammalia.

ORDER I.—QUADRUMANA.

THIS order comprehends the two large families of Monkeys and Lemurs, which have their hind feet converted into hands, by being furnished with thumbs.

Family 1.—MONKEYS; *Simiada*.

The members of this family approach nearest of all animals, in form, appearance, and habits, to those of the human race. They mimic, as it were, the “Lords of the Creation;” hence their appellation from the Latin *Simia*, “an imitator.”

ILLUSTRATIVE EXAMPLES.

PLATE 1.		
Genera.	Species.	Common Name.
Simia - - - - -	Satyrus - - - - -	Orang-Outang.
Semnopithecus - - - - -	Manrus - - - - -	Lotong.
	Nasicus - - - - -	Proboscis Monkey.
Cynocephalus - - - - -	Mormon - - - - -	Great Baboon.

PLATE 2.		
Cebus - - - - -	Ruber - - - - -	Red Monkey.
	Fatuellus - - - - -	Horned Monkey.
	Sciureus - - - - -	Squirrel Monkey.
	Paniscus - - - - -	Four-fingered Monkey.
Hapale - - - - -	Communis - - - - -	Striated Monkey.
	Rosalia - - - - -	Silky Monkey.

Other Genera of this Family :—Cercopithecus, Hylobates, Nyctipithecus.

CHARACTERS OF THE GENERA.

1. SIMIA (Gr. *σιμος*, a flat nose). Teeth close-set and continuons; four incisive in each jaw, erect and cutting; cuspid teeth rather longer than the former; molar teeth five on a side in each jaw, the anterior two bicuspid, the posterior three quadricuspid; muzzle long, truncated, or rounded anteriorly; facial angle from 35° to 30°; face naked; nostrils separated by a narrow septum; ears like those of a man; no cheek pouches; two pectoral teats; neither tail nor callosities; all the feet five-toed and furnished with flat nails.
2. SEMNOPITHECUS (Gr. *σεμνος*, venerable and *πίθηκος*, a Monkey). Incisive teeth four in each jaw, two middle ones of upper jaw broader than the others; cuspid teeth long, pointed, slightly inclining outwards; in the upper jaw the second bicuspid rather longer than the first, both divided by a deep longitudinal groove, and the outer larger than the inner point; in the lower jaw the first so-called bicuspid pyramidal, single-pointed, and tall, the second similar to the second upper bicuspid, but with a small additional ridge near the base of the crown; molar teeth three on a side in either jaw, and on the crown of each four points, except the third, which has five points; head long from before backwards, compressed laterally,

- and rounded behind; face naked, flat above, and rather prominent below; nose depressed at its base; nostrils lateral, oblong, and semilunar; ears margined; body slender, limbs very long, especially the posterior; thumbs minute and near to the fingers; tail very long; rump furnished with callosities; cheek-ponches rudimental.
3. CYNOCEPHALUS (Lat. *dog-headed*). Incisive teeth four in each jaw, close set, and upright; cuspid longer than the former, conical or pyramidal, and sharp on their hinder edge; molar five on a side in each jaw, the first twice as long as the others, the last rather larger than the rest and in many species five-pointed; muzzle prominent; nostrils divided by a narrow septum; facial angle varying between 45° and 30°; face bare; cheek-pouches; auricles either with or without the edge turned over; all the feet five-toed, and the nails either flat or slightly arched; rump furnished with callosities; tail of different lengths, in some species long, in others short, and in a few a mere tubercle.
4. CEBUS (Gr. *κῆβος*, an Ape with a tail). Teeth as in man, with the addition of four more molar teeth; tail long; no cheek-pouches; the rump hairy and without callosities; nostrils piercing the sides of the nose and not at the under part.
5. PITHECIA (Gr. *πίθηκος*, a Monkey). Incisive teeth close-set, in the upper jaw four obliquely prominent, and separated by a gap from the cuspid, in the lower jaw also projecting, long, narrow, and the outer ones narrowed toward their tip; cuspid teeth long, trigonal, and pyramidal; molar teeth six on a side in each jaw, their crowns armed with six blunt tubercles; head rounded; muzzle obtuse; chin sometimes bearded; ears with their edges curled; nostrils separated by a wider septum than the space supporting the upper incisive teeth; tail of various length, and largely covered with loose hair; feet five-toed, the nails flat.
6. HAPALE (Gr. *ἁπαλός*, soft). Incisive teeth nearly upright, close, and four in each jaw; the lower sometimes longer and narrower than the upper; cuspid teeth conical, longer than the incisive, to which they are contiguous in the lower, but from which they are distant in the upper jaw; molar teeth having a broad surface, studded with little points, five on a side in each jaw; face bare, nostrils separated by a broad septum, and expanded laterally; no cheek-pouches; ears flat; buttocks hairy, tail long, and not prehensile; feet five-toed, the nails compressed and pointed, except those of the great toes of the hind feet, which are flattened; the thumbs of the fore feet hardly separated from the fingers.
7. CERCOPITHECUS (Gr. *κέρκος*, a tail, *πίθηκος*, an Ape). Cheek-pouches; the last molar tooth in the lower jaw having four tubercles as the others; tail; callosities on the rump.
8. HYLOBATES (Gr. *ὑλη*, a wood, *βαίνω*, I walk). Teeth regularly arranged, without any gap; incisive four in each jaw, upright; cuspid rather longer than the incisive, conical; molar five on a side in either jaw, anterior two bicuspid, posterior three quadricuspid; facial angle 60°;

rump bare, furnished with callosities, but no tail; feet and hands five-fingered, the latter touching the ground when the animal is erect.

9. *NYCTIPITHECUS* (Gr. *νύξ*, night, *πίθηκος*, an Ape). Incisive teeth four in each jaw, the middle upper flattish and little prominent, the outer smaller, triangular, and rather set back; lower incisive rather wide on their edge, and close set in a semicircular form; cuspid moderate sized, and equal in both jaws: molar six on a side in each jaw, with slightly-pointed crowns; nose flat; cheeks prominent, but face very small; orbits very large; top of the head flattened; ears distinct, flat, and hairy; body slender and covered with woolly hair; tail longer than the body, and not prehensile; hind legs longer than fore legs; claws short, compressed, slightly pointed, that of the great toe slightly flattened.

SIMIADA.—DESCRIPTION OF THE SPECIES.

SIMIA—*Monkey-like animals*. The genus, as first formed by Linnæus, included the whole of the Monkeys, commonly so called, thereby bringing together numerous animals, which though sufficiently allied to admit their collection as members of a family, differed so materially in many points, as to lead to a better arrangement. Illiger converted the Linnæan genus into a family consisting of no less than thirteen genera, which number has been increased by later zoologists; Temminck, for instance, to fifteen, and by other writers still more numerous. Long indeed before the time of Linnæus, writers on Natural History had in a cursory manner observed, that among the Monkeys there were several groups. Aristotle speaks of three kinds, *πίθηκοι*, *κῆβοι*, and *κυνοκέφαλοι*, of which he says that the *πίθηκος* has no tail, being a biped, (on which point, however, he is incorrect,) that the *κῆβος* is a *πίθηκος* with a tail, and that the *κυνοκέφαλος*, with the form of the *πίθηκος*, is of more bulky and stronger proportions, but that its face rather resembles that of a Dog. The counterpart of these terms exists in the Latin words *Simia*, *Cercopithecus*, and *Cynocephalus*; and in our own language we find very loosely used the several terms *Ape*, *Ape without a tail*, or *Monkey*, and *Baboon*.

The animals forming this genus are now generally known by the name of *Orang-Outang* or *Orang-Utan*, the Malay phrase, signifying "a wild man;" and of all the Monkey family most nearly resemble the human form. Hence have arisen the fabulous accounts of Pigmies; and even Linnæus has propped up this error by placing in his genus *Homo*, under the name of *Homo Troglodytes*, one of the species called by Bontius *Homo Sylvestris Orang-Outang*, which is the *S. Satyrus* of Linnæus himself.

Till within a few years it was supposed that there existed but two species of Orangs, the Black or Chimpanzee, and the Red or Orang-Outang commonly so called. From the observations of Fischer and Owen it however appears, that there are really three species, of which the Red Orang may be regarded as the type; and the latter zoologist has also proved that another animal commonly called the *Pongo*, and generally considered by zoologists as a distinct genus in the Monkey family, is in reality only the adult of the Red species. He has given a very minute account of the difference, so far at least as their bony structure is concerned, in a paper in the first volume of the "Zoological Transactions," *On the Osteology of the Chimpanzee and Orang-Utan*; and the result of his comparison of the two animals leads him to agree with Geoffroy in the formation of the two subgenera, *Troglodytes* and *Pithecus*.

It would seem that these animals only in their childhood, as it may be called, exhibit that mildness of disposition and docility which have been considered as separating them widely from others of the Monkey family, and approximating them to man, whilst in their adult state they become morose and vicious, characteristic changes corresponding with the change in their organic structure, and common to the whole family of Monkeys. As regards their station and motion in the erect position, it has been shown by Camper, Owen, and others who have minutely examined them with reference to this point, that they are not more truly biped than others of the same family; and that the form of their hind limbs entirely precludes the erect posture, though, in connection with other points of their anatomical structure, it admirably suits them for the kind of life to which they are

destined, viz., that of living among and climbing on trees, upon the fruits of which they live.

In their wild state they consort together in the woods, far away from the dwellings of men, and though stated to be well known to the inhabitants of the districts near which they live, it would seem that this knowledge arises from the accidental appearance of individuals who have wandered from their usual haunts, and, losing themselves, have been caught sight of and captured by the natives, rather than from being continually about them, as is the case with very many of this family. Hence has arisen the difficulty of procuring them, their consequent rarity in collections of animals, and the great interest excited by them when obtained; added to which, that all the specimens of either species brought either to Europe or America have been young, and with whatever care they have been tended have speedily fallen victims to the change of climate, and probably to the change of food.

The characteristics of the Chimpanzee (*Simia troglodytes*), or Black Orang, are:—Muzzle long, truncated anteriorly; strong, supraciliary ridges, behind which the forehead recedes directly backwards; no cranial ridges; facial angle 35° , excluding the supraciliary ridges; auricles large; thirteen pairs of ribs; sternal bones in a single row; arms reaching below the knee-joint; feet wide; hallux (great toe or thumb of the foot) extending to the second joint of the adjoining toe; canine teeth large, overpassing each other, the apices lodging in intervals of the opposite teeth; intermaxillary bones ankylosed to the maxillaries during the first or deciduous dentition.

The first authentic account of the Chimpanzee is that given by Dr. Tyson, in 1751, under the name *Pygmy*: his animal was a male from Angola, which measured twenty-six inches from the top of the head to the heel in a straight line. The hair was of a coal-black colour, "straight, and much more resembling the hair of men than the furr of brutes;" it was thicker and longer on the hind than on the fore parts of the body; the sides of the face were well covered with hair about an inch long; upon the upper lip and chin were a few "greyish hairs like a beard." Tyson considered his animal to be biped, and says, "'tis sufficiently provided to walk erect." He had, however, previously noticed, "that it would make use of its hands to supply the place of feet. But when it went as a quadruped on all four, 'twas awkwardly; not placing the palm of the hand flat to the ground, but it walk'd upon its knuckles, as I observed it to do when weak, and had not strength enough to support its body." This, however, has been proved, by more frequent observation than Tyson had opportunity for, to be the animal's natural mode of walking when upon the ground. Of his manners it is said that he was "the most gentle and loving creature that could be. Those that he knew a-shipboard he would come and embrace with the greatest tenderness, opening their bosoms, and clasping his hands about them; and, as I was informed, tho' there were Monkeys aboard, yet 'twas observed he would never associate with them, and, as if nothing akin to them, would always avoid their company." When "a little used to wear cloaths, it was fond enough of them, and what it could not put on himself it would bring in its hands to some of the company to help him to put on. It would lie in a bed, place his head on the pillow, and pull the clothes over him as a man would do," but its habits were not cleanly.

In 1835, the Zoological Society had in their gardens a young male individual of this species, which measured two feet from the heel to the top of the head. An account of its manners whilst in confinement is given by Mr. Broderip in the *Proceedings of the Committee of Science and Correspondence* of that Society for the same year. It was bought off the Gambia coast, and in the preceding autumn had been brought about a hundred and



twenty miles from the interior of the country, and was stated to be about twelve months old. The mother was said to have been four and a half feet high, and was shot at the same time the young one was captured. Mr. Broderip says, that when he saw him his "aspect was mild and pensive, like that of a little withered old man; and his large eyes, hairless and wrinkled visage and man-like ears, surmounted by the black hair of his head, rendered the resemblance very striking, notwithstanding the depressed nose and the projecting mouth. When not otherwise occupied, he would sit quietly in the lap of the old woman who tended him, pulling about his toes with his fingers with the same pensive air as a human child exhibits when amusing itself in the same manner." When spoken to, Tommy, as he was called, endeavoured to do the same, gesticulating as he stood nearly erect, protruding his lips, and making a hoarse noise, "hoo, hoo," somewhat like a deaf and dumb person endeavouring to articulate. "The effect of presenting a looking-glass before him when in the midst of his play was very interesting: his attention was instantly and strongly arrested; from the utmost activity he became immoveably fixed, steadfastly gazing at the mirror with eagerness and something like wonder depicted on his face. He at length looked up at me; then again gazed at the glass. The tips of my fingers appeared on one side as I held it; he put his hands and then his lips to them, then looked behind the glass, then gazed again at its surface, touched my hand again, and then applied his lips and teeth to the surface of the glass, looked behind again, and then, returning to gaze, passed his hands behind it, evidently to feel if there was anything substantial there." A large Python, enveloped in a blanket, having been brought in a hamper into the same room, and then uncovered, Tommy cautiously advanced to the basket, peered over its edge, and instantly, with a gesture of horror and aversion, and the cry *hoo, hoo*, darted away to his keeper for protection, but no inducement could bring him back to the same spot till the Snake had been removed. To a live Tortoise he also showed aversion, but not horror. He took his rest in a sitting posture, leaning forward with folded arms, and sometimes with his face in his hands; sometimes, however, he slept prone, with his legs rather drawn up, and his head resting on his arms.

Of the *Orang* (*Pithecus*) the following are the characteristics:—Muzzle large, lengthy, and rather rounded in front; slight supraciliary ridges; forehead receding, sagittal and lambdoidal crests strong; facial angle 30° ; auricles small; twelve pairs of ribs; arms reaching nearly to the ankle-joint; no round ligament in the hip-joint; feet long and narrow, the foot thumb not reaching the root of the adjoining toe, and often having but a single joint, and that nail-less; cuspid teeth very large, and extending beyond the intervals of the opposite teeth; intermaxillary ankylosed to the maxillary bones in the second dentition.

The *Red Orang* (*Simia Abelii* or *Pithecus Satyrus*) is distinguished in several particulars from the *Black Orang*. The most important difference, however, is, that in this species the foot thumb, of which the concavity is turned more towards the toes, is shorter, not reaching the head of the metatarsal bone of the next toe, whilst in the Chimpanzee it always reaches to the second phalanx of that toe. The hair of this species is of a reddish-brown colour, thickest upon the back, but thin upon the front of the trunk.

The *Simia Satyrus* of Linnæus is, according to Mr. Owen, an immature *Orang*, with the deciduous teeth, and probably the young of this species. They are natives of Sumatra. Plate 1.

The first scientific description of the *Red Orang* is that published by Vosmaer in 1778: in the same year Camper also produced an Essay, entitled *Kort Bericht wegens de Ontleding van verschiedene Orang-Utangs*, in which he details the results of his examination of eight individuals of this species; and his account of their anatomical structure is as faithful as Tyson's of the *Black Orang*.

In August 1817 was exhibited at Exeter Change a young male of this species, which had been brought from Java by Dr. Clarke Abel (on the return of Lord Amherst's embassy to China), in whose hands he had been placed by Captain Methuen, who had obtained him at Banjarmasin on the south coast of Borneo, to which place he had been brought from the

highlands of that island by the natives, who considered him rare. He measured from the heel to the crown of the head two feet seven inches. Whilst in Java he lived on fruit, especially mangostans, of which he was exceedingly fond, and drank water; but on the voyage fed indiscriminately on all kinds of meat, especially that which was raw, and was fond of bread, but preferred fruit when he could get it. He preferred coffee and tea, but would readily take wine, and was fond of spirits, as evinced by stealing the captain's brandy bottle; but at Exeter Change he preferred milk and beer to anything else. Whilst on shipboard he was taught "to eat with a spoon; and might be often seen sitting at the boatswain's cabin-door enjoying his coffee, quite unembarrassed by those who observed him, and with a grotesque and sober air that seemed a burlesque on human nature." He was easily irritated when balked of food offered to him, and showed great address in obtaining it. He neither grimaced nor was prone to mischief as Monkeys generally, but was grave approaching to melancholy, and mild in his disposition. He died on the 1st of April 1819, having been an object of great interest and curiosity to the public, and the first of his species which had been exhibited alive in England. Since that time several have been brought to England.

The *Dusky Orang* (*Simia Wurmii*) of Wurm is not recognised as a species distinct from the *Red Orang*, it having been satisfactorily proved to be an adult animal of the *Red* species.

SEMNOPITHECUS—the *Doucs*. This genus of animals was named by Fred. Cuvier from the gravity of its manners. It comes between the *Hylobates*, which it resembles in the length of its limbs, and the *Cercopithecus*, like which it has a long tail. The form of the skull approximates it to the former genus, as do also the callosities on the rump. But the most striking character of the *Semnopithecus* is observed in the length of the limbs; the fore limbs are very slender, but the hinder are longer and stouter, which enable them to make astonishing leaps, and distinguishes them from all the other Monkeys of India. The thumbs are strong, and placed near the fingers, so that the motions of the hand are more perfect; the nails of all the fingers rounded, but of the thumbs flat. The form of the teeth has been already noticed. The fur is long and silky. They are all natives of India or China: are generally mild and placid whilst young, but as they advance in age become dull and morose.

The *S. Entellus*, a species of this genus, is a native of the East Indies, and is called by the natives *Houlman*. They pay to it religious honours, and it occupies a very prominent station among the Hindu divinities. It makes its appearance in Lower Bengal about the end of the winter; and Duvaucel states that he had great difficulty in procuring a specimen, as the Bengalese feared to destroy one, from a popular notion that the slayer of a *Houlman* would die in the course of a year; and so careful were they of these animals, that during his stay at Chandernagar a guard of Brahmins were constantly employed beating tom-toms to scare away the sacred animals which were tempted to his garden for the sake of the fruit. In the Hindu mythology the *Houlman* is considered as a hero, alike renowned for his power, courage, and agility: he is said to have brought to Bengal the mango, one of their most highly-prized fruits, which he had stolen from the gardens of a famous giant in Ceylon; for this robbery he was condemned to the flames, and in smothering the fire he burnt his hands and face, which have since remained black.

The characteristics of the species *S. Maurus* (Plate 1) are briefly these:—Length of the head and body, two feet three inches; tail, two feet four inches; when standing on all-fours, about twelve or thirteen inches high; fur long, delicate, soft, and silky. When first born, this species is of a reddish-brown colour, which gradually changes in age; a greyish tinge first appearing on the forehead, hands, and tip of the tail, thence extends to the neck, shoulders, and sides, gradually become darker till it acquires the black coat of the adult. This species is found both at Sumatra and Java; in the former island it is called by the natives *Lotong*, and in the latter *Budeng* or *Lutung Itam*. They are found in the forests living in large troops of more than fifty individuals, feeding on wild fruits of every description, and when approached utter loud screams. They are very

morose, and when confined are rarely if ever tamed. They are often hunted for their fur, which is used for horse equipage and military ornament.

The species *S. Nasica*, or Proboscis Monkey (Plate 1), measures from the tip of the nose to the root of the tail twenty-three and a half inches, the tail is two feet and two inches, the fore limbs twenty, and the hind twenty-two inches. This species is remarkably characterised by the great size of its nose, which is four inches in length, and has the nostrils opening on the under surface of its tip. Geoffroy has placed it, on account of this peculiarity, in a distinct genus, which he calls *Nasalis*; but Cuvier still retains it among the *Semnopithecii*. Wurmh, who first noticed this species, says that they live in large troops among the forests of Borneo, that they assemble morning and evening by the side of streams, and dart with great agility from tree to tree at a distance of fifteen or twenty feet. Their cry is very deep and distinct, and resembles the word *Kahau*, hence they are called by the colonists *Kabau*, but the native name is *Bantanjan*.

Besides the above species there are also the following:—The *Cochinchina Monkey* (*S. Nemæus*), called by the natives *Duk*, a rare animal; the *Simpai* (*S. Malalophos*), found in the woods of Sumatra; the *Lutung Mera* (*S. Pyrrhus*), an inhabitant of Java, and a special favourite with the natives, who take great care of it, when caught, on account of its beauty; the *Chingkau* (*S. Cristatus*), of Bencoolen, an almost untamable animal, met with in Sumatra and the Malay Islands, called by the natives *Kra*, from its cry.

CYNOCEPHALUS—the *Baboons*. The general habits of these animals correspond with those of other *Simiæda*, and they are mostly natives of Asia and Africa. The genera includes Baboons with short tails, Baboons with long tails, and True Baboons.

1. Those with long tails include the following species:—*Lion-tailed Baboon* (*Papio Silenus*); the *Chinese Monkey* (*Papio Sinicus*), a native of Ceylon; the *Bonnet Monkey* (*Papio Radiatus*), an inhabitant of the Malabar Coast; the *Hare-tipped Monkey* (*Papio Cynomolgus*), found in Guinea, Angola, and Java; and the *Black faced Macaque* (*Papio Carbo-narius*).

The *Lion-tailed Baboon* is in length about eighteen inches from the nose to the tail, which is about half as long as the body; general colour deep black, excepting the beard, which passing from each side of the face descends upon the chest, and varies from ash-colour to pure white; the naked face is flesh-coloured, except the muzzle, which is black; the callosities on the rump are also flesh-coloured. Fischer mentions three varieties; the first black with a white beard, the second white with a black beard, and the third entirely white. The editor of "The Gardens and Menagerie of the Zoological Society Illustrated" has given the following amusing notice of this species from the writings of Father Vincent Maria, the Procurator-General of the Bare-footed Carmelites. "There are four sorts of Monkeys found on the coast of Malabar. The first (the Wanderow) is perfectly black, covered with glossy hair, with a white beard surrounding his chin, and extending a span or more in length. To this Monkey all the rest pay such profound respect, that they submit and humiliate themselves in his presence, as though they were capable of appreciating his superiority and pre-eminence. The princes and great lords hold him in much estimation, because he is endowed above every other with gravity, capacity, and the appearance of wisdom. He is easily trained to the performance of a variety of ceremonies, grimaces, and affected courtesies, all which he accomplishes in so serious a manner, and to such perfection, that it is a most wonderful thing to see them acted with so much exactness by an irrational animal." Knox, also, in his account of Ceylon, speaks of these Monkeys as being as large as "Our English Spaniel Dogs, of a darkish-grey colour and black faces, with great white beards round from ear to ear, which make them show just like old men." They are found on the Malabar coast and in Ceylon.

2. We shall next notice a few of the species of Baboons with short tails.

The *Wrinkled Baboon* (*Papio Rhesus*) measures about fifteen inches in length from the nose to the tail, which is nearly six inches in length; the

male is distinguished from the female by its cuspid teeth being more powerful, by its larger size, and by the greater thickness of its whiskers. The fur of this species is of a soft, silky texture, and is mostly hoary. It is found in India, especially in the woods on the banks of the Ganges; when taken young it is docile and tractable, but as it grows old becomes very spiteful.

The *Pig-tailed* and *Brown Baboon* (*Papio Nemestrinus*), a native of Sumatra, is more than two feet long from the nose to the root of the tail, which is four inches in length, and more slender than in the last species.

The *Wood Baboon* (*Papio Maurus*) is nearly two feet in length; general colour deep brown; the ears, face, and limbs black; the tail very short, being little more than a rudiment. From the East Indies.

The back of the *Red-faced Baboon* (*Papio Speciosus*) is of a vinous-grey; chest, belly, hinder and inner parts of the legs, and edges of the buttocks greyish-white; tail very short, and almost hidden in the fur; face red, with a purplish tinge, and encircled with black hair. From the East Indies.

The remarkable diminution in the length of the tail noticed in the last two species leads to others in which there is merely a tubercle instead of a tail; and from this circumstance Cuvier and others have formed them into a distinct genus (*INUUS*); but this seems hardly warrantable, as they otherwise closely resemble this subdivision of the *PAPIONES*. Two we shall mention:—The *Barbary Ape* (*Papio Inuus*), which, when young, is good-tempered, lively, and intelligent, and hence is frequently taught to play tricks; but as it gets old it becomes ill-tempered, fierce, and mischievous. It inhabits Egypt and Barbary, and has become located on the rock of Gibraltar, where it is said to be very common. It walks constantly on all-fours, but unsteadily, as, like all other Quadrumanous animals, it is especially constructed for climbing, which feat it performs with great facility. They live in large troops among the trees of the forest, and boldly attack those enemies which they think themselves able to encounter, and put them to flight by their numbers and incessant cries. When enraged, it chatters with great rapidity, uttering a loud, rough voice, very different from its mild tone when good-humoured. Its offensive weapons are its large cuspid teeth and long broad nails, which, though flat, inflict severe wounds. Its natural disposition to live in company induces it, when in confinement, to adopt any small animal which may be introduced to it; this it carries about at all times, holding it tightly in its arms, and fiercely resenting any attempt to withdraw it from its protection: it derives much amusement from carefully looking over its hair and removing the least dirt, which it immediately puts into its mouth.

The *Black Ape* (*Papio Æthiops*) is from fifteen to sixteen inches in length; is entirely black; the hair woolly, except at the top of the head. From the Philippines.

3. The True Baboons: muzzle very long, and truncated at its tip, in which the nostrils are placed, giving the form and appearance of a dog's nose, and hence they have been called *CYNOCEPHALI*; their tail varies in length in the several species. They are subdivided into the *Common Baboon* (*Papio Sphinx*), a native of the Guinea coast; the *Lesser Baboon* (*Papio Cynocephalus*), a native of Northern Africa; the *Anubis Baboon* (*Papio Anubis*), from Africa; the *Porcine Baboon* (*Papio Porcarius*), native of Africa; the *Hog-faced Baboon* (*Papio Comatus*), called *Chaerna* by the colonists of the Cape of Good Hope; and the *Dog-faced Baboon* (*Papio Hamadryas*). This animal is one of the most savage of the genus, and in confinement is managed only by severity. It inhabits the hottest parts of Asia and Africa, lives among the woods in large troops, and is very dangerous from its fierceness.

Though the several species of the True Baboons partake of the same nasal peculiarity, there are two species distinguished from all the others by the very great length of their muzzle. They are the *Great Baboon* (*P. Mormon*), of which we have a representation in Plate 1, and the *Grey Baboon* (*P. Leucophaeus*). It has been proved by F. Cuvier that the former species (*P. Mormon*) include two which were long considered as distinct, but are now shown to be merely the same at different ages. Before the development of the cuspid teeth, the head of the Mandrill is

wide and short, and the body thick-set; the face is black, and the ribs upon the face wrinkled and blue; the rump has no other than the general colour of the body, and the scrotum is tan-coloured; it is then the *Simia Maimon* of Linnæus; the *Ribbed-nosed Baboon* of Pennant. But as the cuspid teeth begin to project, the form of the body and limbs becomes more slender, and the muzzle begins to lengthen, its tip reddens, the thighs exhibit their beautiful colours, and the scrotum becomes red. In the course of two or three years the cuspid teeth have attained considerable size; the muscles of the limbs have increased very much in bulk, as also has the body, the hinder parts of which, and also the muzzle, are particularly developed; so that, instead of the slight make which the animal had previously exhibited, it now presents a heavy, unwieldy form, similar to that of the Bear. During this time the colouring of the thighs becomes more brilliant, the rump and neighbouring parts assume a brighter red, and the nose reddens throughout nearly its whole length. It is now the *Simia Mormon* of Gmelin, the *Great Baboon* of Pennant. Having attained its full growth, the Mandrill, when erect, is five feet in height, and measures two feet from the tip of the nose to the rump. These animals are natives of Africa, especially of the countries in the neighbourhood of the Gulf of Guinea. Adult specimens are not very frequently brought to Europe. Two, however, have been exhibited in this country within the last few years, one of which was in the Surrey Zoological Gardens, and had been taught various tricks; it was a ferocious and disgusting-looking animal, and was constantly moving about on all-fours.

CEBUS—the *Sapajous*. The animals composing this genus are all natives of America, and they differ slightly in some parts of their anatomical structure from the other *Simiada*. Geoffroy and Desmarest have divided them into numerous genera, but the trifling differences which they have employed for that purpose, can scarcely be sufficient for more than a division into the subgenera *Myctes* (Howlers or Stentors); *Ateles* (Spider Monkeys, the *Sapajou* proper); *Cebus* (Weepers or Capuchins); and the *Sagonius* and *Douroucoulis*. The *Red Monkey* (*Cebus Ruber*), represented on Plate 2, belongs to the first of the above divisions. The length of its body, from the occiput to the origin of the tail, about twenty-two inches; the tail rather more than as long again; general colour a bright red, face black and naked; a few large black bristles on the eyebrows, lips, and chin; belly and chest bare; fingers long. The Indians call this animal the King of the Monkeys. They live in small parties in the woody islets of large flooded savannahs, and never on the mountains of the interior of Guiana. The cry, or rather horrible rattling scream which they make may well inspire terror, and seems as if the forest contained the united howlings of all its savage inhabitants together. It is commonly in the morning and evening that they make this clamour; they also repeat it in the course of the day, and sometimes in the night. The sound is so strong and varied, that those who hear it often imagine that it is produced by several of the animals at once, and are surprised to find only two or three, and sometimes only one. Such was the account given to Dr. Shaw by a person who had seen and kept these animals at Cayenne.

Of the *Preacher Monkey*, or *Brown Howler* (*Cebus Fuscus*)—another species of this genera—Marcgraave gives a curious account: he says, “that one sometimes mounts the top of a branch and assembles a multitude below; he then sets up a howl so loud and horrible, that a person at a distance would imagine that a hundred joined in the cry; after a certain space he gives a signal with his hand, when the whole assembly join in chorus; but on another signal a sudden silence prevails, and then the orator finishes his harangue. It is a dull morose animal, native of the Brazils, living in the wildest deserts, but fond of its female.

The *Four-fingered Monkey* (*Cebus Coaita*, or *Paniscus*) is a species of the subgenus *Ateles* (Plate 2). It measures about two feet in length from the occiput to the tail; limbs very long and slender; thumbs of the fore extremities hidden by skin; nails flat; hair black, long, and rough. They inhabit the parts about Carthage, Guiana, Brazil, and Peru; are extremely active, and it is said that in order to pass from top to top of lofty trees, the branches of which are too distant for a leap, they will form

a chain by hanging down linked to each other's tails, and swinging about till the lowest catches hold of a bough of the next tree and draws up the rest. Dampier has given an amusing account of them, which may be found in his “Voyage.”

The following species belong to this subgenus:—*C. Pentadactylus*; *C. Hypoxanthus*; *C. Marginatus*; *C. Beelzebuth*; and *C. Arachnoides*.

The *Capuchin Monkey* (*Cebus Capucinus*) comes first in order under the subgenus *Cebus*. Its characteristics are: head round; face flat, flesh-coloured, sprinkled with small black hairs; those on the top of the head also short, those on the vertex and top of the occiput black, and forming a well-marked calotte or monk's cap, whilst the other hairs are of a greyish-white; a black line extends from the fore-part of the calotte to the root of the nose; shoulders and outside of arms greyish-white; upper part of the body, flanks, and outsides of thighs, brown, glossed at the points of the hairs with yellow; insides of the arms and thighs deeper coloured than the external; a brown line on the posterior surface of the fore-arm; tail brown. Native of Guiana.

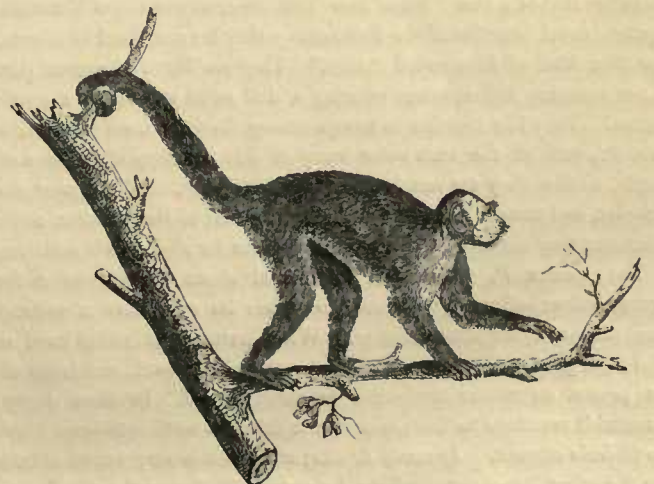
We pass by the *Weeper Monkey* (*Cebus Apella*), so called from its plaintive cry; while of the *Horned Monkey*, or *Horned Weeper* (*Cebus Fatuellus*)—Plate 2—we can give but a very brief notice. Its back is chestnut-coloured, becoming brighter on the sides; belly bright red; extremities and tail of a brownish-black; and it has two strong bundles of black hairs rising on either side of the forehead. Native of Guiana.

There are several other genera under this division, varying merely in colour, for which the reader is referred to M. Geoffroy's paper on the *Quadrumania*, in the nineteenth volume of the “*Annales du Museum*.”

We also include under this subgenus, M. Geoffroy's genus *Callithrix*, which is merely distinguished by the tail being but slightly prehensile; such are the *Squirrel Monkey* (*Cebus*, or *Callithrix Sciureus*), and the *Masked Sagonin* (*Cebus*, or *Callithrix Personatus*), and four other species of minor importance.

The *Squirrel Monkey* (Plate 2) is as large as a Squirrel; face flattish, bare, and white, with a black patch, which includes the tip of the nose and both lips; a small greenish spot on each cheek; upper parts of the body of a yellowish-green, and having a greyish tint on the upper arms and thighs, which changes to a bright orange on the fore arms and legs; tail greyish-green, deeper coloured above than beneath; belly, chest, neck, and cheeks white, slightly tinged with yellow. It is a very docile animal, and surrounds its body with its tail; is fond of insects, and has sufficient sagacity to recognize them in prints. Is native of the Brazils and Cayenne.

The subjoined wood-engraving is a faithful representation of the *White-throated Sapajou*.



White-throated Sapajou.

Mr. Gardner, in his “*Travels in Brazil*,” gives an amusing account of one of those animals (*C. Ateles Paniscus*), which had been so thoroughly tamed as to cause it to become a general favourite. He says, “Jerry became so

fond of tea, that it would not go to sleep without its usual allowance; its favourite food was farina, boiled rice, and bananas, but scarcely anything came amiss to it. Whenever anything was given to it that was too hard to break with its teeth, it always looked about for a stone, and lifting it with one hand, by repeated blows would attempt to crack it; if unsuccessful by these means, it would try to find a larger stone, which it would hold in both its hands, and rising erect on its legs, would let it fall, leaping backwards at the same time to avoid any injury to its toes. Jerry generally rode on the back of a large mastiff dog, and in this manner performed a journey of several thousand miles. These two animals were greatly attached to each other. Before starting, the dog used to go to the place where the little monkey was tied, and wait till it was put upon its back, and its cord made fast to his collar. To prevent itself from slipping over the dog's head, in going down a hill, Jerry made use of his long prehensile tail as a crupper, by coiling the extremity round the root of that of the dog."

The prehensile power of the tails of these animals may be inferred from the following fact, noticed by Darwin in his "Journal of Researches:"—

"My companion, the day before, had shot two large Bearded Monkeys. These animals have prehensile tails, the extremity of which, even after death, can support the whole weight of the body. One of them thus remained fast to a branch, and it was necessary to cut down a large tree to procure it. This was soon effected, and down came tree and monkey with an awful crash."

In conclusion, it is right to observe that the animals under this genus (*Cebus*) are constituted into a family under the name *Cebidæ*, by Dr. Gray, Prince Lucien Buonaparte, and other eminent naturalists. For the present we retain the earlier classification.

PITHECIA—the *Sakis*. Although in some respects resembling the *Sapajous* (*Callithrix*) and the *Saguins* (*Saguinus*), the animals forming this genus are distinguished from the former in not having the tail prehensile, and from the latter in its thick hairy covering. From the *Howlers* (*Myctetes*) they are distinguished by not having the organ of voice so largely developed; and from the other smaller American monkeys they are separated by the blunt form of the tubercles on their molar teeth, and by the flatness of their nails. They generally live together in troops among the woods of Brazil and Guiana, and are slow in their motions, voracious, and dull. Kuhl has divided them into three sections from the varying length of their tail, and from the chin being covered or not with a beard.

First,—Those with very bushy beards, and tails nearly as long as their bodies. The *Simia Satanas* (*P. Satanas*), found on the banks of the Orinoco, and on the banks of the Japura, in Peru. The *Great Paraoua* (*P. Hirsutus*), so called on account of the thickness of its fur, which resembles that of a bear: found near Tabatinga, on the rivers Tonantin and Japura, lateral branches of the Solimoëns; they are very fond of insects, and a peculiar kind of fruit called "inga." They are heard at a great distance in the morning and evening, uttering a dull noise similar to a continued chatter. They live together in troops among the forests, are very active and watchful, and on the least noise hurry off into the deepest recesses of the forests, so that they are caught with great difficulty. When once caught, however, and tamed, they become much attached to their master, approach whenever they see him eating, and run to him for shelter when alarmed.

The species *P. Cheiropotes*, an animal about the size of a fox, is strong, active, sullen, and difficult to tame: its eyes have a melancholy expression mingled with ferocity. When irritated, it raises itself on its hind legs, grinds its teeth, rubs the extremity of its beard, and leaps around the person on whom it desires to avenge itself. In these angry fits, Humboldt mentions he has often seen it drive its teeth into large planks of the *Cedrela odorata*. It rarely drinks; and what is very remarkable, never like the other American monkeys, by putting its lips to the vessel in which water is contained, but by taking up some into the hollow of its hand, which it carries to its mouth, whilst the head is inclined on one shoulder, and it uses either hand indiscriminately. Humboldt mentions that it becomes furious if its beard be wetted, and therefore imagines that in con-

sequence of its being unable to drink in the usual way without wetting its beard, it uses this curious method. They live only in pairs among the forests in the vast deserts of the Alto Orinoco to the south-east of Catactes; they are not, however, very common in the other parts of Guiana. According to Father Juan Gonzalès, the Indians of Atturès and of Esmeralda eat them at certain seasons of the year. The Capuchin Monkeys of Rio Sinu are not, as supposed, either of this species or genus, but a variety of the Red Howler.

The *Jackated Monkey* (*P. Sagulatus*), supposed by some to be the same as the *P. Satanas*. It is a native of the interior of Demerara.

The second subgenus includes those without beards, and whose tails are longer or of the same length as their body. The *White-headed Saki* (*P. Leucocephalus*), *l'Yarqué* of Buffon; a native of French Guiana. The *Fox-tailed Monkey* (*P. Capillamentosus*), whose trunk measures nine inches in length, and the tail ten inches and three-quarters. It is a native of Brazil and of French Guiana, where it is called *Sakka Winkee*. The *Red-bellied Saki* (*P. Rufiventer*), found in French Guiana. The *Red-bearded Saki* (*P. Rufibarbus*), native of Surinam. The *Yellow-headed Saki* (*P. Oreocephalus*), native of Cayenne. The *Monk Saki* (*P. Monachus*). This new species is given with some doubt by Geoffroy, and he thinks it the animal called by Buffon the *Yarqué*, and that it is a native of Brazil.

Besides these there are the *Pithecia Inustus*, inhabitants of the forests bordering the Tonantin branch of the Solimoëns river, near Tabitanga; and the *Miriquina*, natives of the woods in the province of Chaco, and on the western side of the Paraguay river.

The third subdivision are those animals which have short tails, and are destitute of beards. The *Black-headed Saki* (*P. Melanocephalus*): it is called *Cacajao*, or *Cacahao*, by the Maritivaitain Indians of the Rio Negro; *Caruiri* by the Caudaques, or Cabres, of the Mission of San Fernando, near the junction of the Orinoco, Atabapo, and Guaviare; and *Monofeo*, or *Hideous Monkey*, *Chucutu*, or *Mono rabou*, Short-tailed Monkey, by the Missionaries of Cassiquaire. But it is rare. It is a little, voracious animal, but phlegmatic, inactive, weak, and exceedingly gentle. It feeds on all kinds of fruit, even on the sourest citrons, but is especially greedy of the banana, guava, papaya, and the cloves of the ingas. The *Brachyurus Ouakary*: this species is called by the natives *Ouakary*; they always live in troops, principally in the forests bordering the river Iça, one of the branches of the Amazon river, and during the day make the woods ring with their shrill discordant cries.

HAPALE—the *Oustitis*. This genus was long considered as forming part of the subgenus *Pithecia*, in the genus *Cebus*, to which these animals have a near resemblance; but they are distinguished from them by the upright position of the incisive teeth, by the approximation of the cuspid to them in the lower jaw, by the number of molars, which are only five instead of six on a side; by the flat ears, which in the *Pithecia* have the edge curled, and by the indistinct thumb of the hand, and the claw-like nails, whilst the other genus have the thumbs distinct, and the nails flat. They are very docile; and are little, agreeably-formed animals, about the size of our Squirrels, with the rounded head and flat visage of the American Monkey tribe.

The animals included in this genus are subdivided into *Oustitis* with ringed tails, *Oustitis* with tails not ringed, and *Oustitis* with large ears.

1. First, the *Oustitis* with ringed tails:—

Our second plate contains a picture of one species, the *Hapale Vulgaris*, or *Communis*, named, by Geoffroy, *Jacchus*; by Pennant, the *Striated Ape*; and by the inhabitants of Paraguay, *Titi*. Its general colour is ashy; its rump and tail are marked with alternate rings of greyish-brown and ash; a broad white spot on the forehead, and two large tufts of long, fine, ash-coloured hair before and behind the ears; the remainder of the head and shoulders brownish-red; hands and feet brown. The *Titi* is a native of Guiana and Brazil; it walks on all-fours, and cannot grasp with the forehead, except by closing all five fingers, in consequence of the shortness of the thumb; it suffers much from cold and damp, but if taken care of will breed in Europe, having done so in France.

The following animals belong to this division:—The *Pencilled Oustitis* (H. *Pencillatus*); the *White-headed Oustiti* (H. *Leucocephalus*); the *Hairy-eared Oustiti* (H. *Auritus*); and the *White-shouldered Oustiti* (H. *Humeralifer*)—all natives of Brazil.

2. Of the *Oustitis* with tails not ringed, we have the *Black-tailed* (H. *Melanurus*), and the *Fair, or Silvery Monkey* (H. *Argentius*)—natives of the banks of the Amazon river. The general colour of the latter (Plate 2) is white, glistening, and silvery; face, hands, and feet red; tail black.

3. The *Oustitis* with large ears include the *Tamary* of Guiana (H. *Rufimanus*), the *Black* (H. *Ursula*), the *White-lipped* (H. *Labiatus*), the *Yellow-faced* (H. *Chrysomelas*), the *Leonine* (H. *Leoninus*), the *Red-tailed* (H. *Edipus*), and the *Silky Tamary* (H. *Rosalius*)—all natives of South America. The last-named is given on Plate 2. Its characteristics are—face dull purple, and surrounded by long, bright, bay-coloured hairs, which turn backwards, and give it somewhat the resemblance of a lion's countenance, whence it is frequently called the *Lion-faced Monkey*; the hair on the body very long, of a silky texture, and bright yellow colour; hands and feet dull purple; tail rather bushy at the tip. Native of Brazil.

CERCOPITHECUS—Monkey. This genus is one of those into which the genus *Simia* of Linnæus has been divided; it comprehends such animals as have cheek pouches, which are merely the cavities in the mouth, between the cheeks and the teeth, very much enlarged; into these the Monkey crams its food, and will dispose of large quantities in that manner before it begins to masticate. Upon the rump are two callous substances, which are generally bare, on which the animal sits. They are fructivorous, live in troops, and make great havoc in gardens and fields; are easily tamed, but are very mischievous. Their agility is such, that they will leap with the greatest certainty from tree to tree, though burdened with their young clinging at their backs. The negroes believe that they are a vagabond race of men who are too idle to work. In many parts of India they are worshipped; and at Amadabad, the capital of Guzerat, there are hospitals for their accommodation.

The various species of this genus are—the *Red* (C. *Ruber*), the *White Eye-lid* (C. *Æthiops*), the *Green* (C. *Sabæus*), the *Malbrouc* (C. *Faunus*), the *Varied* (C. *Mona*), the *Spotted* (C. *Diana*), the *Mustache* (C. *Cephus*), the *Vaulting* (C. *Petaurista*), the *White-nosed* (C. *Nictitans*), and the *Cochin China-Monkey* (C. *Nemæus*).

The last-named species, together with the *S. Nictitans* of Linnæus, and the *Petite Cynocephale* of Buffon, are formed into a new genus by Illiger, under the title of *Lasiopyga*, in consequence of the rump being covered with hair instead of having callosities; but Cuvier seems in doubt whether the callosities have not been rubbed off when the animal was stuffed, and therefore does not think there are sufficient grounds to establish the genus.

HYLOBATES—the Gibbons. This genus is distinguished from other Apes by the enormous length of the arms, in consequence of which the fingers touch the ground when the animal stands upright.

The *Great Gibbon* (H. *Lar*) is about four feet high; the body long and slender; the head round; head, neck, back, sides of the body and legs black; a narrow circle of grey hairs surrounding the face; ocular region, nose, and extremities of both jaws, brown and naked; upper part of the feet grey, soles black. Native of India.

The species known as the *Petit Gibbon* of Daubenton, is probably a variety of the *Great Gibbon*.

The *Ash-coloured Gibbon* (H. *Leuciscus*), a native of the Moluccas and the Isles of Sunda, is as high as the *Great Gibbon*, while its arms are somewhat longer. The *Siomany* of the Malays (H. *Syndactylus*) is not more than three feet in height, and, in colour, is entirely jet black; the hair long and soft, and forming a shaggy fleece; it is remarkable for having the fore and middle toes of the hind feet connected by membranes, as far as the middle of the second phalanx, and two loose naked folds of skin on the throat, which Sir S. Raffles says he has seen occasionally inflated with air. They are numerous in the woods about Bencoolen, which they make re-echo with their peculiar loud cry.

NYCTIPITHECUS—Nocturnal Apes. This genus is the same as that named improperly by Humboldt, *Aotus*, as in neither species are the auricles either deficient or small. In appearance and gesture, the *Nyctipitheci* much resemble cats, and hence Buffon has called them *Singes du nuit à face de Chat*. They are entirely nocturnal, for which their large sparkling eyes admirably adapt them, but they cannot bear the light. Fred. Cuvier has named the genus *Nocthora*. They are natives of South America. They form the link between the Monkeys and Lemurs, and occupy, in the new world, the place of the *Stenopes* in the old world.

The principal species are the *Brown Douroucouli* (N. *Vociferans*), and the *Black-tailed Douroucouli* (N. *Felinus*). The former measures about seventeen inches long from the nose to the origin of the tail, which is more than a foot in length. It is found in the forests of Solimoëns, near Tabaturga and Mainas; it is very timid and coy, and remarkably delicate in its habits, and much resembles the Tarsiers and Bats of Madagascar. The latter, which is found in the neighbourhood of the capital of Para, is seventeen inches from the nose to the root of the tail; its visage is very similar to that of a cat; the eyes are large and red; the ears are oblong and naked; the body slender, the fur covering its upper surface very close, deep ash-colour at the tip, ferruginous and black at the base; under part of the body, lower part of the thighs, and upper arms hairy, and inclining to ferruginous; tail, which is fourteen inches long, is almost entirely black, except at its root, where it is rusty-grey above, and ferruginous beneath.

Family 2.—LEMURS; Lemuridæ.

The family *Lemuridæ* (Night-prowlers) is distinguished from that of the *Simiada* family by the elongation of their snout, and their participation, in a much greater degree, of the form and habits of quadrupeds.

ILLUSTRATIVE EXAMPLES.

PLATE 3.		
Genera.	Species.	Common Name.
Lemur - - - -	Catta - - - -	Ring-tailed Macaoco.
Lichanatos - - -	Madagascariensis - - -	Short-tailed Indri.
Stenops - - - -	Tardigradus - - - -	Bengal Lori.
Otolienus - - - -	Senegalensis - - - -	Senegal Galago.
Tarsius - - - -	{ Daubentonii - - - -	Daubenton's Tarsier.
	{ Baneanns - - - -	Young of the former.

CHARACTERS OF THE GENERA.

1. **LEMUR.** Upper incisive teeth four, two on a side, separated by a gap in the middle; lower six inclined obliquely forwards; cuspid teeth distinct, flattened laterally, hook-like; molar six on each side above, five on each side below, the anterior single-pointed, the hinder three having four points; nose sharp; face hairy; the eyes directed forwards; ears short and rounded; tail long and hairy; two pectoral mamma; tarsus shorter than the leg; feet five-toed, the fourth of the hind foot longest; thumb-nails flat and broad, that of the posterior index-finger claw-like and subulate; hair soft and woolly.

2. **LICHANOTUS** (Gr. *λίχανος*, the *Index-finger*). Incisive teeth in each jaw four, inclined forwards, those above placed in pairs; cuspid teeth distinct; molar five on each side in each jaw, their crowns studded with blunt tubercles; the anterior two or false molar triangular, compressed and pointed; muzzle sharp; face hairy; eyes looking forwards; ears short and rounded; tail short; tarsus shorter than the tibia; feet five-toed; nails of the thumbs flat, those of the fingers regular, except that of the index of the hind-foot, which is slightly clawed.

3. **STENOPS** (Gr. *στενός*, narrow, and *ὤψ*, a face). Incisive teeth above four in pairs, with an intermediate gap, below six inclined forwards; cuspid long and conical; molar above six on each side, below five, the anterior single pointed; face hairy; muzzle sharp and compressed; auricles short and rounded; eyes large, close set, and looking forwards; four pectoral teats; tarsus rather shorter than the leg; feet five-toed; nails flat, excepting that

of each posterior index, which is claw-like; thumbs short; tail very short.

4. *OTOLICNUS*. In the *upper* jaw incisive teeth four, vertical, in pairs, and these separated by a gap; cuspid teeth large and triangular; molar five on a side, the first pair single-pointed and resembling the cuspid; the others furnished with four tubercles. In the *lower* jaw six very narrow, long, and procumbent incisive teeth; cuspid, thick, and curved; molar as in the upper jaw: muzzle sharp; face hairy; eyes large; ears large and bare; tail very long and hairy; all the feet furnished with thumbs; nails flat, that of the fore-finger or second toe of the hind feet falcular; the tarsi longer than the legs.

5. *TARSIVS*. Incisive teeth in the upper jaw four, of which the middle two are long, strong, and pointed, outer ones small and sharp; in two lower jaws small and pointed; upper cuspid teeth not so large as the middle, but larger than the outer incisive; lower cuspid larger than the lower incisive; molar teeth on each side in either jaw six, the anterior three single-pointed, and increasing in size from the first; the last three in the lower jaw have each two pointed tubercles on their outer edge, a very large one on their inner edge, with two little points between them; in the lower the crowns of their teeth have three points disposed in a triangular form in front, with two others behind separated by a deep groove; head nearly spherical; muzzle short; eyes large, approximated, and directed forwards; ears large, naked; hind limbs very large, as the tarsus is thrice as long as the metatarsus; nails triangular, broad, flat, and excepting those of the second and third toes of the feet, which are narrow, curved, and pointed; body covered with longish and very soft hair; tail very long, with a bushy tip.

LEMURIDÆ.—DESCRIPTION OF THE SPECIES.

LEMUR—Macauco. The genus *Lemur* of Linnæus included species of very different characters, which have been ranged by Illiger, under the genera *Lichanotus*, *Stenops*, *Otolicnus*, and *Tarsius*. The true Lemurs, as now restricted, are distinguished from the *Lichanoti* by having five instead of four lower molars, and by their long tail, which is wanting in the *Lichanoti*; from the *Stenopes* they are separated by their long tail, their less graceful form, and the length of the muzzle, which in the *Stenopes* is very short; from the *Otolicni* and *Tarsii* they are distinguished by the shortness of the foot in comparison with those animals, and by the different form and disposition of the teeth.

The Lemurs are rather elegant in form, and have the hinder rather longer than the fore legs; the body is covered with thick woolly, but soft hair, which much increases the real size of the animal; the head is of a triangular shape, with a sharp and long-extended muzzle, which is bare; the eyes are large and prominent, directed forwards, and very lively. They are natives of Madagascar and the neighbouring islands, and have not been found elsewhere. Like the Monkeys, they live in troops, among the trees, where they feed on fruit, and are extremely nimble. In confinement they are very mild and docile, often becoming attached to their keeper. They move about with much elegance, and with a very light step, usually carrying their long bushy tail above their back. They are extremely chilly, notwithstanding the warmth of their coat, and are fond of basking in the sun, or lying before the fire, with their tail coiled round them, in which state they usually sleep.

The *Ring-tailed Macauco* (*L. Catta*) is rather larger than the common Cat; its fur, which is short, close, fine, and upright, is of a reddish-ash on the back, becoming lighter on the sides; the entire under parts and the insides of the limbs white; face white, the nose tipped with black; the ocular circlets and occiput also black; ears pointed and erect; irides brown; the tail, which is twice as long as the body, alternately ringed about thirty times with black and white; the black skin covering the palm of the hand extends in a narrow line some distance up the arm, overshadowed, however, by the wool. Native of Madagascar and the neighbouring islands, and gregarious. It takes considerable and violent exercise

before going to rest, then seeks a high station, and sleeps with its head dropped on the chest, and its long tail coiled around it. It is very good tempered and cleanly, combing itself with the lower incisive teeth; its cry is weak and similar to that of a Cat. Plate 3.



Head of Macauco.

The other species are—the *Black* or *Ruffed Macauco*, which, it is said, is very fierce in its wild state, but in confinement mild and good tempered; the *Red Lemur* (*L. Ruber*), a rare species; the *Woolly Macauco* (*L. Mongooz*), a good-tempered, but timid animal; the *White-fronted Macauco* (*L. Albifrons*); the *Black-fronted Macauco* (*L. Nigrifrons*); the *Brown Macauco* (*L. Fulvus*); the *Collared Lemur* (*L. Collaris*); the *White-footed Lemur* (*L. Albimanus*); the *Rufous Lemur* (*L. Rufus*), and the *Cinereous Lemur*, the *le Petit Maki* of Buffon, which is the smallest species of the genus. We subjoin a wood-engraving of the *White-fronted Macauco*, with its young one entwined around its body. This animal is about the size of a Cat; and the male is distinguished from the female by having those parts white which in the female are grey. In a specimen bred in France, gestation lasted four months; in six weeks after birth the young fed themselves, and left sucking after six months.



Macauco.

LICHANOTUS—the *Indris*. In form, these animals resemble the *Lemurs*, but are distinguished by the smaller number of the incisive and molar teeth, and the variation in their shape; by the shortness of the ears, and the extreme shortness of the tail. They have, however, the face and muzzle elongated, and the head small.

The *Short-tailed Indri* (Plate 3) is about three feet in height when standing erect; the skin nearly black. This single species is a native of Madagascar, and was first discovered by Sonnerat. It is tamed by the natives, and said to be employed in hunting.

STENOPS—the *Loris*. This genus differs from the *Lemurs*, in having the head large and round; the muzzle, though pointed, short like that of a pug-dog; the eyes very large and close set; the molar teeth more pointed, the pectoral teats four instead of two, and the tail scarcely visible. The general form of the body is somewhat like the Lemurs, but rather more thick-set in one and more delicate in the other species. They are nocturnal animals, and it is presumed live upon small animals, which they seize on whilst asleep.

Our third plate contains a picture of the *Slow Lemur*, or *Bengal Loris* (*S. Bengalensis*, or *Lemur Tardigradus*): it is about thirteen inches in length; head rounded, muzzle short and obtuse, with the nose short and flattened in front, the nostrils opening laterally; body short and thick-set, covered with long, thick, yellowish, deep ashy fur. It is found in Bengal, also in other parts of Hindostan, and in Ceylon, Penang, and Java. This species is extremely slow in its motions, and hence was applied to it, by Linnæus, the specific name *Tardigradus*, as distinguishing it from the other and very active species of his genus *Lemur*.

The habits of this animal, at least in a state of confinement, have been

sufficiently interesting to attract the notice of three observers, Vosmaer, Baird, and Sir William Jones. The first of them, Vosmaer, says, that it slept all day till between eight and nine in the evening, seated on its rump, close to the wires of its cage, with the head bent forwards between its fore feet which were laid on its belly, whilst its hind feet firmly grasped the wires. When aroused, it moved very slowly, drawing itself from bar to bar, taking hold of the upper part of one bar with its fore feet, and not leaving go till it had grasped another bar with one of its hands. Upon the ground it also moved very slowly, dragging one leg after the other as if partially paralyzed, and never raising its body, so that the belly was usually not more than an inch from the ground. No attempt to make it leave go its hold by poking with a stick succeeded, but if hurt and angered, it bit sharply at the stick, uttering the cry *ai, ai, ai*, lengthened into a plaintive, long, and tremulous tone: this occurred especially when it was disturbed in the day, which irritated it much. It was fond of soft fruits and eggs, and destroyed bird and chaffers, which it ate voraciously. Vosmaer says it would only eat biscuit when dry, but not moistened, and that it would not touch water; on the contrary, Baird's animal would not touch it dry, but ate it greedily when moistened and sugared, and lapped water freely like a Cat.

Another species, mentioned by Geoffroy, is the *Nycticebus Javanicus*, the muzzle of which is much narrower than in the preceding species. There is also the *Slender Lori* (*S. Ceylonicus*), which is remarkably distinguished from the *Slow Lori* by the greater elevation of its nose, by its more delicate form, and by the length and slenderness of its limbs; its fur is soft and almost woolly; its general colour is reddish-brown, excepting the tip of the muzzle, sides of the head, lower jaw, and under part of the neck, which are whitish, and the chest, belly, and inside of the limbs, which are white, the latter tinged with yellow; a white patch upon the forehead descends between the eyes, and the ocular circlets are ferruginous. It is a native of the island of Ceylon.

From the difference in the general proportions of *S. Bengalensis* and *S. Ceylonicus*—from the greater delicacy of limbs in the latter, and its more upraised nose—Geoffroy has divided them into two distinct genera, applying to the former that of *Nycticebus*, and to the latter *Loris*: this arrangement, however, we have not thought fit to adopt; but retain them as species of the genus *Stenopes*.

OTOLICNUS—the *Galagos*. These animals have great similarity to the Lemurs, but the length of the hind feet much exceeding that of the legs, and giving to these limbs a very disproportionate appearance, their very large membranous ears, their short, round head, and large eyes situated very low, distinguishing them from the latter animals. Like the Lemurs, they are also nocturnal animals; which is immediately noted by the large size of their eyes. During daytime they live in the hollows of trees, where they make their nest of dry grass, and in the evening, about twilight, leave it for the purpose of hunting after insects and fruit, upon which they feed. They have a long, bushy, and very moveable tail, but it is not prehensile. They have hitherto only been found in Africa and Madagascar.

The species are the *Thick-tailed Galago* (*O. Crassicaudatus*), the *Madagascar Galago* (*O. Madagascariensis*), the *Senegal Galago* (*O. Senegalensis*), *Dermidorff's Galago* (*O. Dermidorffii*), and the *Potto* of Bosman (*O. Guinensis*). The last named is placed by Geoffroy among his *Nycticebi*, the *Stenopes* of Illiger, but the length of the tail sufficiently distinguishes it from them. Its general colour is ferruginous. Of the *Senegal Galago* a representation will be found on Plate 3. This animal is about the size of a Rat; its ears are as long as its head; fur long and thick; the lips and upper part of the nose yellowish-white, and the same colour prevails between the eyes up to the forehead; top of the head, region of the eyes, and cheeks blackish; back dusky-yellow; sides, fore arms and thighs of the same colour but a lighter shade; neck, chest, belly, arms, and legs yellowish; tail much longer than the body, ferruginous, and terminating in a pencil-like form. It is further remarkable for having only two incisive teeth in the upper jaw. It is a mild, inoffensive animal, lives in the hollows of trees, feeds on insects, and is found in Senegal.

TARSII—the *Malmags*. The species are three, viz.:—the *Woolly Jerboa*, or Daubenton's *Tarsier* (*T. Spectrum*), Fischer's *T. Fuscomanus*, and the *Podje* of Horsfield (*T. Baneanus*); Temminck and Cuvier are, however, of opinion that there is but a single species, the *T. Baneanus* and the *T. Fuscomanus* being regarded as the young of the *Woolly Jerboa* (*T. Spectrum*).

The *Woolly Jerboa*, or Daubenton's *Tarsier* (Plate 3), is about the size of the long-tailed field-mouse, measuring with the toes inclusive eleven and a half inches, tail nine and a half inches, almost naked and scaly like that of a Rat; forehead wide and flat; the pupils of the eyes are so very large, that scarcely any other part of them can be seen, and the superciliary ridges but slightly developed; ears large, and projecting laterally; "the whole face," says Sir Stamford Raffles, "has a peculiar and singular aspect, the grinning mouth giving it an odd expression of risibility;" the hairy wool, about half an inch in length, is very soft to the touch; deep tawny on the back, rump, and belly, but paler on the other parts; head ashy; neck short and hands reddish; the toes, excepting the second and third of the feet, have nails so small, that they resemble little scale-like processes; the tips of all the toes are dilated into flat, rounded, fleshy callosities, which are considered to assist them materially in climbing; many of the other joints of the toes have these callosities, but of smaller size.

It is very rare in Sumatra, and only in the deepest woods is one seen in the course of two or three years; here it is called *Singa-pooa*, or Little Lion, and the natives have a story that it was originally as large as a Lion, from which it has gradually diminished to its present size. It mounts the trees with short leaps, and feeds upon young leaves and ripe fruits. The inhabitants have great dread of these animals, insomuch that if they happen to see one upon any tree near their ladangs or forest rice-fields, they will immediately abandon them and seek another spot; otherwise they believe some misfortune will certainly befall them or their family. A representation of the *T. Baneanus* is also contained in our third Plate.

ORDER II.—CHEIROPTERA.

WING-HANDED.

The distinctive features of this order consist in the affinity of their form both to the *Quadrupedia* and *Aves*.

ILLUSTRATIVE EXAMPLES.

PLATE 4.

Family 1.—FRUIT-EATING BATS; *Fructivora*.

Genera.	Species.	Common Name.
<i>Pteropus</i>	<i>Javanicus</i>	Java Rousetta.

Family 2.—LEAFLESS-NOSED BATS.

<i>Molossus</i>	<i>Velox</i>	Swift Molosse.
-----------------	--------------	----------------

Family 3.—LEAF-NOSED BATS.

<i>Phyllostoma</i>	<i>Spectrum</i>	Spectre Bat.
--------------------	-----------------	--------------

Other Genera of these Families:—*Noctilio*, *Nycteris*, *Nycticeius*, *Plecotus*, *Rhinolophus*, *Rhinopoma*, *Taphozous*, *Vespertilio*, and *Galeopithecus*.

GALEOPITHECUS.

The last-named genus must first be noticed before we proceed to the characteristics of the genera which precede it, since Gray and other naturalists have given this genus of the *Cheiroptera* a family distinction, by placing it between the Lemurs and the Bats.

GALEOPITHECUS (Greek γαλήνη, a Cat, and πίθηκος, a Monkey—*Cat-like Monkey*, because it climbs trees like a cat. Its common name is *Colugo*. Its characteristics are:—Upper incisive teeth four, distant from each other; lower incisives four also, declining, their crowns pectinated; cuspid teeth very small, resembling the molars, the lower largest; anterior molar teeth triangular, crown very sharply pointed on a broad base, posterior bearing several points; ears small; neck, limbs, and toes enve-

loped in a broad, expanded membrane; fingers of fore feet shorter than fore arm; nails much hooked, and rather compressed; *mammæ* pectoral.

The animals composing this genus have some general resemblance to the Bats and *Lemures*: from the latter of which, however, they differ, in the elongation of the head, and the smallness of the eyes, and, from the former, in the shortness of the fingers of the fore feet, which prevents the membrane, expanded from the anterior to the posterior extremities, from being used for flying, as by the Bats. The *Colugos* are found in the islands of the Indian Archipelago, live among trees, and feed upon insects; perhaps also on fruit and birds.



Galeopithecus.

The most important species are, the *Red Colugo* (*G. Rufus*), which measures about a foot long; upper part of the body bright chestnut red; under light red; insides of the legs and the neck white. Native of the Pelew Islands: is capable of running on the ground, but climbs trees, and in dropping from branch to branch, spreads out the lateral membranes attached to the limbs.

The *Mottled Colugo* (*G. Variegatus*) is only about half the size of the Red Colugo; upper parts ashy brown, with occasional deeper shades, and spotted with white on the membranes and limbs; under parts greyish brown. This animal is considered by Audebert as the young of the *G. Rufus*. It is noted by Mr. Finlayson, in his account of "The Mission to Siam and Hue," as one of the animals found at Penang. It is also found in the Moluccas.

CHEIROPTERA.—CHARACTERS OF THE GENERA.

Family 1.—FRUCTIVORA.

1. *PTEROPUS* (Gr. *πτερόν*, a wing, and *πούς*, a foot). Incisive teeth in each jaw four, placed in a close, regular, semicircular form in the upper, but often irregularly in the lower jaw; in those species furnished with a tail, regular in both jaws; cuspid teeth long, compressed, and having three faces; molar teeth ten or eight in the upper, and twelve in the lower jaw, the first and last varying in size proportionally to the bulk of the others; muzzle sharp; ears of moderate size; tongue rough and furnished with papillæ; wing membranes large; interfemoral membranes forming only an edging to the hind limbs of greater or less size, in some enclosing the tail, in others only partially, and in some not at all.

Family 2.—LEAFLESS-NOSED BATS.

2. *MOLOSSUS*. Incisive teeth bifid, two above, grooved in front, two below small and deciduous; cuspid longish, conical in the lower jaw nearly approximated, so as scarcely to leave room for the incisive; molar four on a side above, five below, their crowns studded with numerous points, except the front, which have but one; snout long, upper lip pendulous; auricles large, broad, and united at their base.

Family 3.—LEAF-NOSED BATS.

3. *PHYLLOSTOMA* (Gr. *φύλλον*, a leaf, and *στόμα*, a mouth). Two or four incisive teeth in the upper jaw, of which the middle two are the largest; in the lower jaw four smaller and close set; cuspid teeth two in each jaw, the upper sometimes separated from the incisive by a gap; molar either eight in each jaw, or eight in the upper and ten in the lower, or ten in each jaw, or ten in the upper and twelve in the lower jaw, all having pointed crowns, the anterior two or three single, and the rest many-pointed; muzzle more or less elongated, the lower jaw sometimes longer than the upper; upon the top of the nose two cartilages, one erect and of a leaf-like form, the other horizontal and horse-shoe shaped; thumb of the hand clawed; middle finger four-jointed, and all the fingers nail-less; hind

toes all clawed; interfemoral membrane more or less perfect; tail short or entirely deficient.

4. *NOCTILIO* (Lat. *Nox*, night). Incisive teeth, above four, of which the middle two large and conical, the lateral small and tubercular, below two minute and bifid; cuspid long and conical; molar pointed, four on a side in the upper, and five in the lower jaw; snout short, expanded, and cleft, covered with little warty or fleshy tubercles; nose confounded with upper lip, nostrils slightly tubular, approximated, and prominent; ears small and lateral; interfemoral membrane very large and projecting; tail of moderate length mostly included in the membrane; claws of hind legs very strong.

5. *NYCTERIS* (Gr. *νυκτερίς*, from *νύξ*, night). Incisive teeth, above four, contiguous, fixed in a moveable, intermaxillary bone, below six; cuspid large and distinct; molar four on a side in each jaw; cheek-pouches perforated at bottom to give passage to air into the cellular membrane; from the forehead to the tip of the nose a deep longitudinal groove, in front of which are the nostrils, each terminating in a small longitudinal canal, and generally closed; ears longer than the head; skin very loosely connected with body, and forming a bag around the animal; tail as long as the body, enveloped in membrane, and terminating in a bifid vertebra; feet five-toed, the long toes of the fore feet without claws.

6. *NYCTICEIUS* (Gr. *νύξ*, night). Incisive teeth, above, two, separated by a wide space approximated to the cuspid and sharply indented; below, six, truncated, cuspid, without tubercles at their base.

7. *PLECOTUS* (Gr. *πλέκω*, I plait, and *ὄς*, ὠτός, an ear). Auricles much larger than the head, and connected by their base with each other; lesser auricles lancet-shaped, and the auditory passage furnished with a valve; incisive teeth in the upper jaw four, and in the lower six; cuspid two in each jaw; molar, in the upper jaw five on a side, and in the lower six; muzzle simple; mouth furnished with cheek pouches; tail long and included in the interfemoral membrane.

8. *RHINOLOPHUS* (Gr. *ῥίς*, a nose, and *λοφος*, a crest). Incisive teeth, two in the upper jaw; in the moveable intermaxillary bone frequently deciduous, and four in the lower jaw, short and trifid; cuspid teeth long, conical, and distinct; molar five on a side in each jaw, or five on a side in the upper and six in the lower jaw, the anterior false and one or two pointed; the others pointed and tritorial; muzzle obtuse; nose furnished with a very complicated membranaceous apparatus, that part of it in front of the nostrils always assuming a horse-shoe form, that behind varying in figure according to the species, and the nostrils themselves being funnel-shaped; auricles large, simple, and unprovided with opercules; body furnished with digital, lumbar, and anal membranes, which are not covered with hair; upon the breasts two teats furnished with milk tubes, and upon the pubes two warts without milk tubes; the joint of the first finger is single, short, and rudimentary, the others have but two joints; tail contained in the anal membrane, and generally not extending beyond it.

9. *RHINOPOMA* (Gr. *ῥίς*, a nose, and *πῶμα*, an opercule). Incisive teeth in the upper jaw, two small ones apart from each other, in the lower four; two moderate-sized cuspid in each jaw; molar four on a side in the upper and five in the lower jaw, the anterior of these false, the others pointed and tritorial; nose long, conical, cut square at its tip, and furnished with a small leaf-like cartilage; nostrils narrow, transverse, and guarded with a small lobe like an opercule; forehead broad and concave; auricles large, connected together, inclining on the face, and furnished with an outer lobe or opercule; interfemoral membrane narrow, square, and enveloping only the base of the tail. There are but a few species of this genus known, and they have the same habits as our Bats.

10. *TAPHOZOUS* (Gr. *ταφος*, a tomb, and *ζῶω*, I live). Upper incisive teeth two, sometimes deficient, lower four three-lobed; cuspid teeth long, conical; molar five on a side in each jaw, the anterior two of each very small, scarcely visible, the others with pointed crowns; head pyramidal, with a roundish pit on the forehead; ears large, distant; nostrils small, circular, and partially concealed; upper lip very thick; tail short, its basal half

enveloped in the interfemoral membrane; the remainder free, and projecting upwards when at rest; a small pouch in the alar membrane.

11. *VESPERTILIO* (from the Lat. *vesper*, the evening). Incisive teeth *above*, four, cylindrical and sharp, in pairs with an intermediate gap; *below*, six with bifid points; cuspid teeth distinct, long, and conical; molar teeth from four to six on each side in each jaw, sharp pointed, the posterior three tritorial and the anterior conical; muzzle lengthened; ears large, the tragus or earlet always existing; feet five-toed, the thumbs of the fore feet free from the wing-membranes, and furnished each with a claw; tail scarcely projecting beyond the interfemoral membranes, and curved forwards.

CHEIROPTERA.—DESCRIPTION OF THE SPECIES.

Family 1.—FRUCTIVORA.

PTEROPUS—*Wing-footed*. These animals are frugivorous, but some few of them are considered to feed also on animal food; they are of quiet habits; live in large flocks, and during daytime suspend themselves by their hind feet to trees, rocks, or old buildings; but at twilight they take wing and commit great depredations among the orchards. The variation in the number of the molar teeth depends on the absence of the anterior or first molar, which is intermediate between the cuspid and molar teeth, and is of that kind called by Cuvier a *false molar*; it is wanting in those species which have the muzzle shorter than the others; but in some the hindmost molar is deficient, which renders the jaw still shorter. All of them are natives of the Old World, and none have yet been found in America; neither do the statements as to their sucking the blood of persons whilst asleep, which have given rise to the application of the name of Vampires, attach to them, but to the *Phyllostomata*, and as regards them indeed only to a very limited extent.

The *Edible Roussette* (*P. Edulis*, or *P. Javanicus*), Plate 4, is the largest of the genus, varying from eleven to fifteen inches in length, and from three to five feet in extent. Its general form is slender; body very oblong; muzzle long; molar teeth six on a side in the lower, but only five in the upper jaw, the anterior small molar being deficient; muzzle, front of the head, and throat very deep chestnut, more or less tinged with black; fur on the back lying close to the skin, on the under parts more full and crisped; back from the shoulders blackish-chestnut, or blackish, more or less tinged with ash, and the outside of the hind limbs tinged with one or other of these colours; chest reddish-brown, and other under parts blackish-brown, often becoming quite black in the full-grown animal. It is a native of the Indian Archipelago, and very common in the Island of Java, where it is known as the *Kalong*. During daytime it is seen suspended by its large thumb claws to the trees in the neighbourhood of plantations, among the fruit of which it makes great havoc, sallying out at dusk in large flocks in search of food; and this time is chosen by the natives for catching them, which they do by means of a bag fastened to a long stick. They are much valued as food, their flesh being white, delicate, and tender, but it is disliked by Europeans, in consequence of the musky smell it retains from the urine which it discharges when worried. It is this animal which is named *Vespertilio Vampyrus* by Linnæus, and of which so much is said about its sucking the blood of persons asleep. This, however, is an error, for the animal is entirely frugivorous.

Dr. Horsfield informs us in his "Zoological Researches in Java," &c., "That this animal is abundant in the lower parts of Java, and uniformly lives in society." He adds, "Numerous individuals select a large tree for their resort, and suspending themselves with the claws of their posterior extremities to the naked branches, often in companies of several hundreds, afford to a stranger a very singular spectacle. A species of *Ficus*, in habit resembling the *Ficus religiosa* of India, which is often found near the villages of the natives, affords them a very favourite retreat, and the extended branches of one of these are often covered by them. They pass the greater portion of the day in sleep, hanging motionless; ranged in succession with the head downwards, the membrane contracted about the body, and often in close contact; they have little resemblance to living beings, and by a person not accustomed to their economy, are readily mistaken for a part of

the tree, or for a fruit of uncommon size suspended from its branches. In general these societies preserve a perfect silence during the day; but if they are disturbed, or if a contention arises among them, they emit sharp piercing shrieks, and their awkward attempts to extricate themselves, when oppressed by the light of the sun, exhibit a ludicrous spectacle. In consequence of the sharpness of their claws, their attachment is so strong that they cannot readily leave their hold, without the assistance of the expanded membrane; and if suddenly killed in the natural attitude during the day, they continue suspended after death. It is necessary to oblige them to take wing by alarming them, if it be desired to obtain them during the day. Soon after sunset they gradually quit their hold and pursue their nocturnal flights in quest of food. They direct their course, by an unerring instinct, to the forests, villages, and plantations, occasioning incalculable mischief, attacking and devouring indiscriminately every kind of fruit, from the abundant and useful cocoa-nut, which surrounds every dwelling of the meanest peasantry, to the rare and most delicate productions, which are cultivated with care by princes and chiefs of distinction. By the latter, as well as by the European colonists, various methods are employed to protect the orchards and gardens. Delicate fruits, such as mangos, jambus, lausas, &c., as they approach to maturity, are ingeniously secured by means of a loose net or basket, skilfully constructed of split bamboo. Without this precaution little valuable fruit would escape the ravages of the *Kalong*."

Mr. Adam White, in his beautifully-illustrated volume, "Popular History of Mammalia," states that "a specimen of the *P. Javanicus* was kept alive in the Philadelphia Museum for several years. It was quite tame and amiable towards those persons constantly about it, but disliked strangers. During its voyage to Philadelphia it was fed on boiled rice, sweetened with sugar; at the Museum it was chiefly fed on fruit, and now and then enjoyed picking the bones of a boiled fowl."

The *Middle Roussette* (*P. Medius*) measures in length eleven inches, and in extent somewhat more than three feet. These animals are natives of the continent of India, in the neighbourhood of Pondicherry and Calcutta: during certain times of the year, at the latter place, the trees are covered with numbers of them. It is probably the species known among the natives of Hindostan as the *Badur*.

Besides these there are the following species:—The *Black-faced Roussette* (*P. Phaiops*), ten inches long, three and a half feet wide: native of Madagascar. The *Steel-headed Roussette* (*P. Poliocephalus*), a foot in length, three feet and a quarter in extent: found in Australia. In the French Museum it is marked *P. Rubricollis*.

The *Woolly Roussette* (*P. Dasymallus*), eight inches long, two feet four inches wide: is found in the neighbourhood of Nangasaki and Jedo, where it is called *Sobaosiki*, and is very destructive to orchards.

The *Common Roussette* (*P. Vulgaris*), from eight to nine inches in length, three feet in width: it is found in the Isles of France and Bourbon; it is also said to be met with in Madagascar, and perhaps in Africa. At feeding-time it mingles indiscriminately with the following species, on the trees, to which they are attracted by the fruit or flowers; but at other times they attach themselves apart to the large trees in the depth of the forest. It is eaten, and when young, especially, is considered very good.

The *Red-necked Roussette* (*P. Rubricollis*), seven and a half inches long, two feet in extent: found in the Isles of France and Bourbon, and hooks itself up in the hollows of trees and in the clefts of rocks.

The *Pallid Roussette* (*P. Pallidus*), seven and a half inches long, in extent two and a half feet: it is found in the Isle of Banda, and its habits are like those of *P. Edulis*.

The *Keraudren's Roussette* (*P. Keraudrenius*), seven or eight inches long, from two to two feet and a half in extent: it is a native of the Mariannas, where it is eaten, and is called at Guam, which is one of them, the *Fanihi*. It flies in broad daylight, and when at rest suspends itself to the trees.

The *Grey Roussette* (*P. Griseus*), from six to eight inches long, twenty inches in width: native of Timor.

The *Masked Roussette* (*P. Personatus*), six and a half inches in length, twenty inches wide: from the Isle of Ternate.

The *Black-headed Roussette* (*P. Malanoecephalus*), three inches long, eleven in extent: is found in the most solitary parts of the Island of Java, where it is called *Batoeanvel*.

The *Kiodate Roussette* (*P. Minimus*), three and a half inches long, from ten to twelve in extent: is a native of Java and Timor, where it is very destructive in the orchards, and especially prefers the fruit of the jambu; it is nocturnal, and during the day attaches itself to the higher branches of the trees. In the Malay language it is called *Lovo-Assu*.

The *Straw-coloured Roussette*—the *Lesser Ternate Bat* of Pennant (*P. Stramineus*)—seven inches long, two and a half feet in extent: native of the Isle of Timor. It feeds on fruit, and is found suspended in caverns and on the branches of trees, in the holes of which it also sometimes hides itself.

Ægyptian Roussette (*P. Geoffroyi* or *P. Ægyptiacus*), five and a half inches long, twenty in extent: is a native of Egypt and the western parts of Africa, and like our bats attaches itself to the roofs of old buildings.

The *Teat-lipped Roussette* (*P. Tithæcheilus*), five and a half inches long, from seventeen to twenty inches wide: from the islands of Java and Sumatra. This species exhales a very strong odour, probably from the neck, encircled by diverging hairs, and Temminck thinks that the frontal bag in *Rhinolophus Speoris*, the opening on the chest in *Phyllostoma Hastatum*, the throat-bag in *Dysops Velox*, and the chin-bag in *Taphosous Saccolaimus*, all serve the same purposes.

The *Amplexicaudate Roussette*, four and a half inches long, sixteen wide: found at Bencoolen, Siam, and also in the isles of Timor, Amboina, and Sumatra.

The *Bordered-eared Roussette* (*P. Marginatus*) closes our catalogue: it is rather more than three and a half inches long and thirteen in extent.

Family 2.—LEAFLESS-NOSED BATS.

MOLOSSUS.—These animals have a very disagreeable physiognomy; their head is large, with a very broad snout, resembling that of a mastiff, whence they have been named; the ears large, arising near the commissure of the lips, project over the eyes, to which, says Geoffroy, they serve the purpose of protection rather than to favour the perception of sound. The tragus is placed in front, and external to the auditory passage, which distinguishes this genus from the greater number of this order, in which it is placed within the ear, forming as it were a second auricle; the muzzle has no hairs, the tongue soft, the nostrils situated in a kind of little collar extending beyond the lips. In all, the hind limbs are very short, the fibula perfect, and often as large as the tibia; the tail long, but half of it enveloped in the interfemoral membrane; the wings are disproportioned to the size of their large and heavy body, being very narrow, and in some species so much so that they can hardly serve the purpose of more than a parachute; the thumbs of the wings short, but broad and strong. They live in caverns, are not able to fly well, but climb the trunks of trees and the walls with great vigour, and probably feed on insects.

The principle species of the *Molossus* of the old world are—

The *Collared Molosse* (*M. Cheiropus*) rather more than five inches long, and the extent of the wings two feet: a native of the Indian Archipelago. The *Plaited Molosse* (*M. Plicatus*), four inches and a quarter long, and eleven and a half in extent, about the size of the common European Bat, *V. Murinus*: native of Bengal, and very common about Calcutta. The *Rupelian Molosse* (*M. Rupelii*), larger than the last: native of Egypt. The *Ægyptian Molosse*, three and a half inches long, nine and a half wide: native of Egypt. The *Slender Molosse* (*M. Tenuis*), five inches long, thirteen wide: found in Java.

The species common in the New World include the *Rufous Molosse* (*M. Rufus*), five inches long, thirteen wide; the *Black Molosse* (*M. Alecto*), five and a half inches in length, twelve in width; the *Shorn Molosse* (*M. Abrasus*), somewhat smaller than the last; the *Long-nosed Molosse* (*M. Nasatus*), four inches long, near eleven wide; the *Dusky Molosse* (*M. Obscurus*), three inches long, nine inches wide; and the *Swift Molosse* (*M. Velox*), Plate 4, three and a quarter inches long, ten wide; ears rather

larger than high, and joined on the forehead; membranes not very wide but tolerably long, hairy above and beneath, in front of the neck a little glandular; the fur very short and smooth, very deep shining chestnut above, but a little lighter beneath: from Brazil.

Family 3.—LEAF-NOSED BATS.

PHYLLOSTOMA.—These animals are natives of South America, where, like all the Bats there found, they are considered by the Brazilians to bite the skin and suck the blood both of men and animals, and hence have acquired the name *Morcego*. This opinion has been pretty generally held; but much doubt is thrown upon it by observations of recent travellers in the Brazils. Waterton, in his "Third Journey to Guiana," says, "Many a night have I slept with my foot out of the hammock to tempt this winged surgeon, expecting that he would be there; but it was all in vain, the Vampire never sucked me, and I could never account for his not doing so, for we were inhabitants of the same loft for months together." In his fourth journey, however, he mentions that a young Indian, whilst sleeping in his hammock in the shed next to his, was severely sucked in the great toe, and that the hole made in it was of a triangular shape. This is but one of the more recent notices of these alleged bloodthirsty animals; but the old voyagers, Peter Martyr, Ulloa, and Condamine, mention the circumstance as a well-authenticated fact.

The *Phyllostomes* are distinguished among the Leaf-nosed Bats from the *Rhinolophi* and *Megadermata* by the more simple form of their nasal appendages, and from the latter also by their auricles being unconnected at their base, and by having incisive teeth in both jaws. Among themselves they differ as to the number of their incisive and molar teeth; but this alone, unless it were very great and their form very dissimilar, cannot be considered sufficient for their division into distinct genera. Spix has indeed arranged them in the two genera *Phyllostoma* and *Vampyrus*, the principal distinction being the greater length of the jaws in the latter than in the former, which have no tail, whilst his *Vampyrus* has a short one. The arrangement which we have followed is on the plan of Geoffroy in the "Annales du Muséum," vol. xv., in which all are included in one genus, with two subdivisions, containing those which have and those which have not a tail.

First, those with tails:—The *Javelin Bat* (*P. Hastatum*), five inches in length, twenty-three in breadth. According to Prince Maximilian's observations, this species is a native of Eastern Brazil, but he found it more especially at the River Mucuri and at Villa Viçosa on the Peruhype. It flies at some height and strongly, though not very quickly, in the evening, and often comes in at the windows in summer-time, when it makes a great noise. During daytime it conceals itself near the houses, among the leaves of the cocoa-palm, in high trees among the woods, and in the leafy tops of trees. It is generally believed that these Bats suck the blood of men and animals whilst asleep; and Prince Maximilian observes, that although he had never seen them in the act of sucking, yet after the fluttering noise of their wings had been heard in the evening, the beasts of burthen about which they had congregated were streaming with blood, and at one station, the Rio das Contas, they were quite spent from the bleeding.

In Mr. Darwin's "Journal of Researches," &c., we find (p. 22) the following confirmation of the blood-sucking qualification of some of the South American Bats:—"The Vampire Bat is often the cause of much trouble, by biting the horses on their withers. The injury is generally not so much owing to the loss of blood, as to the inflammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one (*Desmodus d'Orbigny*, Wat.) was actually caught on a horse's back. We were bivouacking late one evening near Coquimbo in Chile, when my servant, noticing that one of the horses was very restive, went to see what was the matter, and fancying he could distinguish something, suddenly put his hand on the beast's withers and secured the Vampire. In the morning the spot where the bite had been inflicted was easily distinguished from

being swollen and bloody. The third day afterwards we rode the horse, without any ill effects."

We have only space to name the other species: *P. Macrophyllum*, *P. Elongatum*, *P. Crenulatum*, *P. Breviceaudatum*, *P. Sovicinum*, *P. Cirrhosum*, and *P. Bidens*.—All these have tails.

Bats of this genus without tails embrace—the *Spectre Bat* (*P. Spectrum*), Plate 4. This animal is about five and a half inches in length, and twenty inches in extent. The fur of this species is soft, of a chestnut colour above, and reddish-yellow beneath. Geoffroy considers this species to be the *Andera guacu*, of Piso, who says it is as large as a Dove. It is generally held by Zoological writers that this is the species referred to by Condamine as the Bats which destroyed the cattle introduced by the Missionaries at Borja, and also those mentioned by Ulloa as being very common at Carthagena, and so much given to blood-sucking as to be a great scourge to the natives; but no satisfactory relation has been hitherto given as to the other species besides *P. Hastatum*, in reference to this point. It can hardly be considered, though generally so esteemed, as the Bat which bled Captain Stedman so profusely at Surinam, as it, as well as all the other individuals of this genus, are natives of South America only. We may here add that though several recent travellers in South America have recorded instances of the bloodthirstiness of some of the Bats of that Continent, yet they all reject the exaggerated statements which earlier writers have published respecting them. We refer to the works of Denman, Ischudi, Graham, and Azara.

The names of other species are *P. Planirostre*, *P. Jamaicense*, *P. Brachyotum*, *P. Perspicillatum*, *P. Superciliatum*, *P. Lineatum*, *P. Rotundum*, and *P. Lilium*.—Without tails.

NOCTILIO.—The Bats of this genus are very remarkable for the cleft in the upper lip, which from its resemblance to that of Hares has given rise to the name of *Hare-lipped Bats*, sometimes applied to them. Cuvier and Temminck include them all in a single species.

NYCTERIS.—The animals composing this genus are distinguished from the others of the same family by the ease and elegance of their flight, and by the power they possess of inflating their skin with air so as to render themselves specifically lighter, in which respect they have some analogy to Birds. This curious property was pointed out by Geoffrey St. Hilaire; the termination of the tail in a bifid piece like a reversed T is also a peculiar character of this genus, and distinguishes it from all the other Bats.

NYCTICEIUS.—This genus, founded by Rafinesque, so nearly approaches the *Vespertiones*, except in the disposition of the incisive teeth, that Temminck almost doubts the propriety of separating them.

PLECOTUS.—The individuals forming this genus were separated from the *Vespertiones* by Geoffroy, in consequence of the connection of the roots of their auricles, and from the greater number of their molar teeth.

Two species we shall briefly notice:—

The *Eared Bat* (*P. Vulgaris*), which is the smallest of the Bat kind, measuring not more than an inch and three-quarters in length, and seven in breadth: it is found both in towns and in the country, hiding itself in old towers, where it lives alone. Its cry is generally feeble, but when disturbed becomes distinct and shrill. It is found throughout Europe and in Africa. Two varieties are observed of this species: viz. first the *Aegyptian*, which is much smaller than ours, and has its fur of a more ferruginous colour, and the last vertebra of the tail more detached from the membrane; and second, the *Austrian*, which is much larger and of a darker colour.

The *Barbastellus* (*P. Barbastellus*) measures about four inches long and eleven wide; it is found in houses; lives in company with the *Pipistrelle* Bats, and hibernates with them. It has a very fetid smell. It is found in France, though not very commonly, still less frequently in Germany, especially towards the north, occasionally in England. Some naturalists have elevated this species into a distinct genus.

RHINOLOPHUS—*Horse-shoe Bat*.—This genus belongs to the insectivorous tribe of Bats, its first finger or index having only a single joint or phalanx. It is one of the most remarkable kind of Bats, and is distinguished by

the great size of its ears, and by the complication of its nasal apparatus. But that which distinguishes it from all other genera of its family is the existence upon the pubes of a pair of warty teats, besides the true teats upon the breast. These, according to Kuhl's observation, are deficient in the first year of the animal's life, in the second are extremely small, and only in the third year acquire their proper size; but, though connected with reproduction, he has never been able to find any lactiferous glands near them. The auricles are very simple, consisting merely of a large gristle, but without any opercule as in the other insectivorous Bats, which renders them deaf at pleasure, by shutting up the auditory passage; and hence it is that, during daytime, they bury themselves in the deepest holes and most private recesses. The imperfection of this organ is, however, fully compensated by the remarkable development of the nose. Its external cartilages or gristles are disposed and folded so as to form a funnel, which may more easily catch and conduct the scent to the interior of the nose; the nostrils themselves have a circular or oval form, and are placed at the bottom of the funnel, the expanded upper part of which is bounded in front and on the sides by a fold or folds of membrane which assume the form of a horse-shoe, whence is derived the English name of the genus; posteriorly it is bounded by one or two membranes which assume various forms. This disposition, although found in others of the same family, is most fully developed in the animals of this genus. The thickness of the lip arises from the numerous muscular fibres which lie close together and run in different directions. They remain during daytime in the deepest holes, and come out at night in search of insects. They are of various sizes.

The *Horse-shoe Bats* are arranged into three classes: viz., 1, those with the upper nasal membrane erect and spear-shaped; 2, those with the upper nasal membrane stretched transversely; and 3, those with the upper nasal membrane transverse and a pouch on the forehead. 1. The *Single-speared Horse-shoe Bat* (*R. Unihastatus*), *Double-speared Horse-shoe Bat* (*R. Bihastatus*), both natives of Europe, the latter common in England; the *Trident Horse-shoe Bat* (*R. Trideos*), a native of Egypt, and was discovered by Geoffroy in tombs and caves; the *Lesser Horse-shoe Bat* (*R. Minor*), native of Java. 2. The *Noble Horse-shoe Bat* (*R. Nobilis*), the *Masked Horse-shoe Bat* (*R. Larvatus*), the *Common Horse-shoe Bat* (*R. Vulgaris*), the *Deformed Horse-shoe Bat* (*R. Deformis*), all natives of Java; *Commerson's Horse-shoe Bat* (*R. Commersonii*), native of Madagascar; the *Crowned Horse-shoe Bat* (*R. Diadema*), a native of the isle of Timor; and the *Ridge-nosed Horse-shoe Bat* (*R. Clivosus*), which lives in holes in walls and rocks, and is a native of Africa. 3. The *Pouched Horse-shoe Bat* (*R. Speoris*), a native of the island of Timor.

RHINOPOMA.—Two species of the animals forming this genus are:—The *Microphyllus*, which measures two inches in length; the tail an inch more; auricles nearly half an inch long; expanse of wings seven inches and a third. They are found in the lowest chambers of the Pyramids near Cairo.

The *Carolinense*, two inches in length; the tail an inch and a half more; expanse of the wings eight inches. Is a native of Carolina.

TAPHOZOUS—*dwellers in tombs*.—This genus was formed by Geoffrey St. Hilaire on a specimen found by him in the Egyptian Catacombs; the tail, when the animal suspends itself at roost, seems to project beyond the margin of the interfemoral membrane; it is, however, only sheathed by it, and when the membrane is expanded in flight it slips off, and the tail is no longer seen.

The species are—*T. Perforatus*, found in the deep caverns at Ombos, and in the tombs of the kings at Thebes; *T. Lepturus*, a native of Surinam; *T. Mauritanus*, native of the Isle of France; *T. Longimanus*, common in dark store-rooms in Calcutta; and *T. Rufus*, common in Pennsylvania. Godman mentions, on the authority of Titian Peale, a remarkable instance of maternal affection in one of this species. "In June 1823, a boy caught a young Red Bat, which he took home with him. Three hours afterwards, in the evening, as he was conveying it to the museum in his hand, whilst passing near the place where it was caught, the mother made her appearance, followed the boy for two squares, flying round him, and finally alighted on his breast, such was her anxiety to save her offspring. Both were

brought to the museum, the young one firmly adhering to its mother's teat. The faithful creature lived two days in the museum, and then died of injuries received from her captor."

VESPERTILIO.—Of this interesting genus—all insect feeders—there are in England no less than twelve species. Generally throughout the day they remain hidden in hollow trees, clefts of rocks, caverns, under the eaves of houses, or other out-of-the-way places, suspending themselves by their hind claws with their heads downwards, and crowding together one over another so closely as to make it matter of astonishment how they can find room to attach themselves. But as soon as the sun sinks below the horizon, and twilight appears, their busy time arrives, and they are seen darting and swimming around trees, or flitting over streams where gnats and other crepuscular insects are swarming, and, as it were, inviting their voracity, till morning dawns, when they speedily fly off to their retreats. All the Bats hibernate, but for very different periods; the *Pipistrelle*, our most common species, is seen almost to Christmas, and reappears as early as the middle of March. They produce rarely more than one or two at a birth, and carry them in their wing membranes as in cradles. Spallanzani found that though deprived as far as possible of sight, scent, or hearing, they were still capable of flying about and avoiding every obstacle against which they might be presumed likely to strike when set at liberty in places unknown to them, and that they were able even to pass through passages which were only sufficiently large to admit them. This remarkable phenomenon has been beautifully explained by Cuvier, who observes, that "the membrane uniting the hands and fingers presents to the air a very extensive surface; the nerves distributed to it are numerous and very extensively divided, forming an admirable net-work by their delicacy, and by the number of their anastomoses. It is probable that in the act of flight, the air struck by the wing, or this so-sensible hand, impresses on it a sensation of heat, cold, mobility, resistance, indicating to the animal the obstacles and facilities which it meets with in its flight. Thus is it that blind men distinguish with the hand, and even with the face, their approach to a wall, to the door of a house, to a street, before touching them, and by the simple sensation of different resistance of the air." (*Leçons d'Anatomie Comparée*, vol. ii. p. 581, 1st edit.)

A division of the Bats into two sections, though perhaps of but little importance, may be founded on the different shape of the tragus or earlet, which stands up like a valve before the passage leading to the ear-drum, it being in some species more disposed to a lance-like or even linear shape, whilst in others, with a narrowish base, it spreads upwards into a kidney or heart-shaped process.

1. Bats with the lancet-shaped earlet. The *Mouse-coloured Bat* (*V. Murinus*), three and a half inches in length, extent of the wings fifteen inches. This is one of the largest European, and the largest British Bat, and here of extreme rarity, being only authenticated as caught in the gardens of the British Museum. They live in large companies, frequenting old retired buildings, but do not resort to woods, and avoid the society of other species.

Bechstein's Bat (*V. Bechsteimii*), two inches in length, twelve inches in width: it is a native of Europe, but rare in this country, and hitherto only taken in the New Forest, where it lives in small parties of a dozen or thirteen, resorting solely to hollow trees, never approaching dwelling-places, and not intermixing with other species.

The *Reddish-grey Bat* (*V. Nattereri*), length of head and body nearly two inches: a native of England, not infrequently living in hollow trees and caverns in company with *V. Barbastellus* and *Mystacinus*, and also with *Plecotus Auritus*. It is found also in other parts of Europe.

The *Whiskered Bat* (*V. Mystacinus*), head and body measures nearly two inches: is a native of England and other parts of Europe; rarely frequents houses, and is said to prefer the neighbourhood of water, and is sometimes found in caverns.

Daubenton's Bat (*V. Daubentonii*), head and body two inches in length: a native of England, is found also in many parts of Germany and in Denmark; flies rapidly near the ground or over stagnant waters.

The *Pygmy Bat* (*V. Pygmæus*), length of head and body not quite an inch and a quarter: is very numerous in the neighbourhood of Dartmoor forest, where it was first discovered by Dr. Leach, but is by some persons considered doubtful, and perhaps only the young of another species.

The *Hairy Bat* (*V. Polythrix*), *Slender Bat* (*V. Lævis*), *Blackish-Bat* (*V. Nigricans*), *White-bellied Bat* (*V. Leucogaster*), *Long-nosed Bat* (*V. Naso*), all natives of Brazil; the *Painted Bat* (*V. Pictus*), a native of Ceylon; and the *Great Serotine* (*V. Maximus*), a native of Guinea.

2. Bats with the battledoor-shaped tragus. The *Great Bat* (*V. Noctula*), head and body nearly three inches long. The Great Bat, which, next to the *Mouse-coloured* species, is the largest English species, is spread pretty generally over Europe. It lives in large companies, nesting in the hollows of trees, in caverns, and under house-roofs. Its flight is very rapid and high; hence White gave it the specific name of *Altivolans*. Its active life is shorter than that of any other species, not appearing till the end of April, and retiring in July, according to the observations of the last-quoted zealous naturalist.

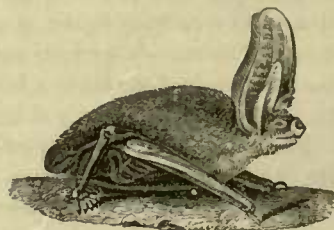
The *Common Bat* (*V. Pipistrellus*), length of the head and body rather more than an inch and a half. This species is the most common Bat in England, as determined by Jenyns, but not the *Common Bat* of Pennant; and it is generally spread throughout Europe. It is more active than the other species, having been noticed about as late as the middle of December, and reappearing in the middle of March. Jenyns observes its places of retirement are crevices of decayed brick walls, in the cracks of old door-frames, or behind the leaden pipes frequently attached to buildings for carrying off rain. Its flight is quick and flitting, whence one of its vulgar names, *Flitter Mouse*. It frequents the neighbourhood of rivers, flying over them or about the trees on their banks, in search of various kinds of gnats, which Bell considers are probably its chief food.

"If a Bat be placed," says Mr. Patterson, in his useful little volume, "*Zoology for the use of Schools*,"—"If a Bat be placed on the smooth surface of a table, its awkward attempts at walking give an idea of helplessness akin to that which was suggested to naturalists when the Sloth was seen upon the ground. Yet compassion in both cases would be alike misplaced. Each animal is gifted with powers of locomotion adapted to its wants. The Bat can climb with ease the rugged and perpendicular surface of a tree, or can wheel its flight in the air, though burthened with one or two young adhering to its teats."

The *Particoloured Bat* (*V. Discolor*), rare in this country, but found in Germany. The *Serotine Bat* (*V. Serotinus*), which measures somewhat more than two inches and a half in length: it is rare in this country, and hitherto observed only in the neighbourhood of London; but it is spread pretty generally over central Europe. It is common in the woods of France, and not infrequent on the timber stacks in Paris. It is rarely found but in pairs, and sometimes singly. Like the Great Bat, it appears late in spring, and flies throughout the night.

The *Hairy-armed Bat* (*V. Dasycarpos*), length of the head and body two inches and a half. It is found in Germany in large societies in hollow trees, but not intermixed with other species, and is fond of the neighbouring stagnant waters. There is in the British Museum a single specimen said to be British, and the only one presumed to be such.

There are many other species enumerated in larger works.



Bat walking.

ORDER III.—SARCOPHAGA.

PREYERS.

This order is characterised by its flesh-eating propensity; hence its designation from two Greek words, *σάρκος*, "flesh," and *φαγω*, "I eat."

Family 1.—INSECT-EATERS; *Insectivora*.

ILLUSTRATIVE EXAMPLES.

PLATE 4.

Genera.	Species.	Common Name.
Erinaceus - - - -	Europæus - - - -	Common Hedgehog.
Sorex - - - - -	Araneus - - - - -	Common Shrew.
Talpa - - - - -	Europæa - - - - -	Common Mole.

Other Genera of this Family:—Centetes, Mygale, Scalops.

CHARACTERS OF THE GENERA.

1. ERINACEUS.—Body covered above with spines instead of hairs, and capable of being bent up on itself to form a prickly ball; tail short, and feet plantigrade, five-toed; the two middle upper incisives separate from each other, longer than the others, and conical; nose slightly projecting.

2. SOREX (Gr. *ῥαξ*, a Rat or Mouse). Front teeth in each jaw two, in the upper bicuspid, in the lower very long, horizontal, and denticulated above; on each side, in the upper jaw, five or four false molar, the first and last larger than the intermediate, in the lower jaw two false molars; true molar teeth with pointed crowns, three on a side, in each jaw; muzzle long and conical; eyes very small; ears small, rounded, and not always apparent; body covered with soft fur, and on each flank a row of odoriferous glands; tail varying in length, and but rarely equalling that of the body; feet plantigrade, toes distinct, five on each foot.

3. TALPA (Gr. *τυφλός*, blind). Incisive teeth of nearly equal size, in the upper jaw six, and in the lower eight; cuspid teeth two-fanged, the upper very long, curved, pointed, and sharp on their hinder edge, the lower not elevated above the molar teeth; in the upper jaw on each side seven molar teeth, of which the first three small, and the fourth much larger, are all single-pointed, and the other three have cutting edges with two points on their crowns; and in the lower jaw on each side six, of which the front three are single and the hind three double-pointed; muzzle lengthened, and the snout forming a sort of proboscis truncated; eyes very small; no auricles; body full, roundish; tail short and scaly; limbs short, the anterior very strong and bulky, and furnished with a pair of broadly-expanded feet, having their soles facing outwards with a sharp inner or under edge, five toes webbed to the roots of the claws, which are long, wide, rounded, and sharp pointed; posterior limbs very slender, feet plantigrade, with five toes armed with slender, sharp, slight, curved claws; fur soft, thick, and silky.

4. CENTETES (Gr. *κεντέω*, to prick). Body covered with bristles and spines; tail short or wanting entirely; cuspidate teeth two in each jaw on either side; the incisores between and before them; molares five on each side in both jaws, having their crowns cuspidated, of a triangular shape; the base of which is behind.

5. MYGALE (Gr. *μυγάλη*, a Shrew). Incisive teeth—in the upper jaw two, sharp and triangular, in the lower four, long, narrow, and parallel, with truncated crowns, the middle two smaller than the outer; cuspid none; molar, in the upper jaw seven, in the lower four false on each side; in the upper three true pointed, in the lower six of the same on each side; the muzzle sharp, with a projecting, flattened, moveable nose, having nostrils at its tip; eyes small; auricles deficient; body clothed with long hair; tail compressed; feet five-toed, webbed, plantigrade; the soles bare; hind feet hairy on their outer edge; claws falcular.

6. SCALOPS (Gr. *σκαλλω*, I dig). Incisive teeth in each jaw two, perpendicular and cuneiform, the lower smallest; no true cuspid teeth; in upper jaw, on either side, six false molar, of which the anterior four are cylindrical, the last two lance-shaped, with their points inclining

backwards; three molar with many-pointed crowns: in lower jaw, on each side, from four to seven false molar, conical, but obtuse, and three molar with many-pointed crowns; muzzle lengthy, and terminating in a cartilaginous button; eyes small; auricles deficient; body thick, cylindrical, without distinct neck; tail short; legs short; feet five-toed, the fore feet very wide and strong, the toes connected to the last joint, their claws large, semilanceolate, with narrow and rather obtuse points; claws of hind toes much shorter, compressed, and sharp.

INSECTIVORA.—DESCRIPTION OF SPECIES.

ERINACEUS: the *Hedgehog*. The common Hedgehog (*E. Europæus*), Plate 4, has the ears short, lives in hedges, and is very common. In the winter it burrows and becomes torpid; but in spring leaves its hole in search of insects, which are its ordinary food, and occasionally fruits also. It is a shy and timid little animal, and when disturbed rarely attempts to escape, but rolls itself up into a prickly ball, and from this form will not disengage itself, but rather closes more firmly the more it be irritated, except when thrown into water, on which it speedily unrolls. It is easily domesticated, and is very useful indoors to destroy Beetles and other troublesome insects. A curious fact has been observed by Pallas, that the Hedgehog feeds without injury upon the *Cantharides*, a single one of which produces excruciating torments in the Dog and Cat. Native of Europe.

The *Long-eared Hedgehog* (*E. Auritus*) is found from the north of the Caspian Sea as far as Egypt.

There are about eighteen or nineteen species of Shrews. In form and habits they have a general resemblance to the small kinds of Mice, but are less vivacious. They are of small size, and among them are found the smallest Mammalia, such as the *S. Etruscus*, *Pulchellus*, *Personatus*, and *Religiosus*, which scarcely exceed the smallest Humming-bird in bulk.

The teeth of this genus are, as remarked by Isidore Geoffroy, extremely interesting, as being intermediate between those of the true carnivorous and those of the rodent animals, and linking them together.

The limbs of this genus are not so short as they seem to be, arising from their feet being of the plantigrade kind, that is, the fore feet resting on the ground as far as the wrist, and the hind so far as the heel. The toes are all distinct and have no indication of web, not even in those species which are aquatic, some of which have them, however, fringed with strong hairs, which serve the same purpose as the loose fringes on the toes of the Grebes and Divers; the inner and outer toe of each foot is deeply cleft from the others, by which they are enabled to be far spread and the breadth of the paw much increased, an analogy to which has been observed by Geoffroy in some of the Marsupial animals; the claws are short, curved, compressed, and sharp. The tail is always shorter than the body, sometimes scaly, and sometimes covered with fur. Like the Bats they possess the remarkable power of rendering themselves deaf at will, and thus preserving their auditory organs from injury by sudden and violent noise.

The eyes are so extremely small, that Geoffrey St. Hilaire has designated them as "*véritablement un organe tombé en atrophie*," a peculiarity which belongs to all the subterraneous carnivorous animals. The Shrews are remarkable for their strong musky odour, which arises from a series of odoriferous glands situated along the flanks, and nearer the fore than the hind limbs.

Some of the Shrews are found in both the Old and New World, but others are not, and whilst some prefer dry soils, others are found only in wet or marshy districts. Generally they live in holes, but sometimes make their way into granaries or cellars, where their presence is soon known by their musky odour.

The *Fetid* or *Common Shrew* (*S. Araneus*), Plate 4, measures, head and body, from two to two and a half inches in length; its tail is an inch and a half, which is thick, blunt at the extremity, covered with short, close, stiff, dusky hair, but not fringed on its under surface; colours variable; ears small, having within two folds or lobes, one beneath the other, and edged with hair; feet small, the hinder not fringed. It is common upon

dry soils in Europe, feeding on worms and insects, which its long flexible snout enables it to rout up from beneath the surface of the soil with great facility. The cry of this species is a shrill whistle. In spring the female brings from five to seven young ones, which she deposits in a slight hole lined with soft herbage, and being covered at the top is entered on the side. Towards autumn they are found dead in great numbers, but without any assignable reason. They are extremely pugnacious, and if two be put in a box a contest takes place which terminates only in the death of one, the greater part of which is eaten up by the survivor. They have a peculiarly strong musky smell, which renders them so offensive, that though cats will kill they will not afterwards meddle with them. The Shrew was formerly considered venomous, and vulgar tradition assigned to it such malignity, that it was said to lame the foot over which it ran. "Our ancestors," says Dr. Johnson, "looked on her with such terror, that they are supposed to have given her name to a scolding woman, whom for her venom they call a *Shrew*."—Gilbert White states, "It is supposed that a Shrew Mouse is of so baneful and deleterious a nature, that wherever it creeps over a beast, be it horse, cow, or sheep, the suffering animal is afflicted with cruel anguish, and threatened with the loss of the use of the limb." These absurd suppositions were to be remedied by equally absurd antidotes in the shape of the twigs or branches of a Shrew Ash, gently applied to the limbs of cattle, which are immediately relieved of the pains caused by the running of a Shrew Mouse over them. This Shrew Ash was made thus, according to Gilbert White: "Into the body of the tree a deep hole was bored with an auger, and a poor devoted Shrew Mouse was thrust in alive, and plugged in, no doubt with several quaint incantations long since forgotten."

The *Water Shrew* (*S. Fodiens*) is common throughout many parts of Europe, in the neighbourhood of streams and marshy ground; and in the spring produces six or eight young. It is well adapted for swimming by the fringing of its toes, and moves in the water with great speed. The length of its head and body is three and a quarter inches, of the former an inch, and of the tail rather more than two inches.

The other species are—the *White-toothed Shrew* (*S. Leucodon*) and the *la Musaraigne* (*S. Constrictus*), found in the neighbourhood of Strasburg, Chartes, and Abbeville; *Foster's Shrew* (*S. Fosteri*), and the *American Marsh Shrew* (*S. Palustris*), inhabitants of the fur districts of North America; the *Short-tailed Shrew* (*S. Brevicaudus*), the *Small Shrew* (*S. Parvus*), and the *Masked Shrew* (*S. Personatus*), natives of Missouri and other parts of America; the *Sacred Shrew* (*S. Religiosus*) and the *Perfuming Shrew* (*S. Giganteus*), found in the tombs at Thebes; the *Oared Shrew* (*S. Renifer*), found in some parts of England and also in France; the *White-faced Shrew* (*S. Lineatus*) and the *Square-tailed Shrew* (*S. Tetragonurus*), inhabitants of Paris and other parts of France; the *Beautiful Shrew* (*S. Pulchellus*), found in the sandy desert, near Bokhara; the *Indian Shrew* (*S. Indicus*), in Sumatra and on the continent of India; the *Flaxen Shrew* (*S. Flavescens*) in Caffreland; the *Mouse-tailed Shrew* (*S. Myosurus*) from Java; the *White-collared Shrew* (*S. Collaris*), at the mouths of the Scheldt and the Meuse; and the *Tuscan Shrew* (*S. Etruscus*), found in Tuscany under the roots and in the trunks of old trees, among heaps of leaves or straw, in the holes of banks, and in winter in dunghills, where it finds both food and protection from the cold.

TALPA—the Mole.—This genus of animals is furnished with forty-four teeth: in the upper jaw six incisive, closely, regularly set, and nearly vertical, followed on each side by a long, curved, pointed, cuspid tooth, much flattened laterally and with a sharp cutting hinder edge, to which succeed three small single-pointed or false molar teeth, and behind them four true molar teeth, which, excepting the first, have many sharp points on their crowns; in the lower jaw the incisive teeth are eight, of nearly equal size and projecting rather forwards, behind them the cuspid teeth, of so small a



Teeth of Insectivorous Animals.

size that they scarcely rise above the crowns of the other teeth, and of very similar form and size to the first upper true molar, that is, a sharp elevated point at the front of its crown, whilst the hind part forms a sort of heel or step; three small false molars, of similar form but less size, follow the cuspid on each side, and behind them are three true molar teeth, of which the points on their crowns are well developed, and plainly indicate the insectivorous habits of the animal.

A very remarkable circumstance in connection with the Mole is the extremely small size of its eyes and the minuteness of the aperture between the eyelids, hence it has been commonly considered to be blind; and this opinion was supposed to be held upon the authority of Aristotle, and retained till Ray had observed, in his beautiful work on the Creation, "Moles have perfect eyes, and holes for them through the skin, not much bigger than a pin's head;" and it was subsequently found that these eyes could be used.

The limbs of this genus present a remarkable instance of the perfection of development in reference to the animal's habits; for, though the fore limbs have little resemblance in shape to the hind ones, and are but awkward instruments for walking, yet for the important function of tunneling they are most admirably adapted, and the whole general arrangement of the bony and muscular structure of the animal is subservient to this point.

The hand or fore paw is very large, wide, and expanded like a rounded shovel, and from its front project the last joints of the five fingers, which, with their long, strong, and semicylindrical claws, are as long as the other two joints and the palm of the hand together. The palm is much widened by a sickle-shaped bone, which, extending from the wrist to the root of the innermost claw, and having a thin edge, forms the palm into an excellent scoop. The hind limbs are, even for the size of the animal, small, but in comparison with the fore limbs exceedingly diminutive.

As might naturally be supposed from such powerful organs as the fore limbs, the Mole is exceedingly active in its mining operations, and buries itself almost instantly when placed on the ground. Jesse mentions that he "turned one loose upon a lawn, the turf of which was on a bed of strong gravel, and particularly hard and dry. Notwithstanding these disadvantages, the Mole contrived to bury itself almost in an instant, working into the earth by means of her snout and fins (for they can hardly be called feet) so fast that the ground seemed to yield to her mere pressure."

Whilst employed in burrowing, the animal rests on its belly, and perhaps the hind feet being inclined outwards assists in throwing the dirt still further back; but it would seem more likely that the hind feet serve rather as cramps to steady the animal on the ground and prevent it receding by the opposition which the soil offers to the penetration of the muzzle. The earth in these burrows is not always actually removed: at first it is only thrown behind the animal; but as the Mole passes the same road again and again, the crumbled soil becomes gradually thrust against the sides of the passage, and, being more and more pressed, at last forms very solid and permanent walls. Nothing seems to stop its course whilst driving its tunnels; if the soil be too firm and hard for it to bore, it does not waste its time in unavailing efforts to pierce it, but, changing its level, is directed by unerring instinct to descend sufficiently low to pass beneath it, and having reached more congenial soil, it again elevates its course till it has attained its usual proximity to the surface. Neither are they checked by water; for Mr. Bruce (*Lin. Trans.* vol. iii.) mentions one which was seen at 10 o'clock at night close to an islet in the Loch of Clunie, and which must in passing from the main land have swum a distance of 180 yards. That this could not have belonged to the islet would seem probable from a pair only having been observed at intervals of several years, which each time were destroyed, and none other seen on the islet. Le Court and Jesse also have observed that the Mole swims with perfect ease.

Of the organs of sense, those of smelling are the most largely developed in the Mole. As Geoffrey St. Hilaire well remarks, "Is there any organ of sense which could supply more efficiently, to an animal living under

ground, the imperfection of the other senses than that of smell? It is a kind of touch at a distance, which reminds one of the direct touch of the Bat's wing."

Moles are predaceous and extraordinarily voracious, being almost furious in satisfying their hunger, which is supposed to be in them a more violent feeling than fear. Their usual food is worms, ants, the grubs of cock-chafers and beetles, and they are commonly, though incorrectly, believed to eat the roots of the herbage; which, however, is not the case, but the mischief which they cause to the roots is by disturbing the ground about them in their hunt after animal food.

Our remarks upon the two species of the Mole must necessarily be very brief.

The *Common Mole* (*T. Vulgaris*), Plate 4, is rather more than five inches long; incisive teeth of equal length; aperture between the eyelids very small, surrounded by a narrow, bare skin, and hidden by the fur, which is attached around it in a circular form; the fur is close, short, soft, and almost velvet-like; its ordinary colour is glossy deep black, but varying according to the position in which the animal is held: thus looking from the head towards the tail, it has an ashy tinge, but is dull black when viewed from tail to head. The Mole is, however, subject to great variety of colour, piebald, grey, cream-coloured, and tawny.

Le Court observes that the Mole in its passage across streams is directed by its sight, and that the fur which usually overspreads the apertures of the eyelids, when moistened by the water, separates, and radiating forms a sort of circular frill around the eye, which is then fully exposed. But that under common circumstances they really do see, is proved by the following experiment, which Le Court made in the presence of Geoffroy. Into a piece of earthen water-pipe several Moles were successively introduced, and at the open end Le Court stationed himself; whilst he remained quite still, the Mole moved rapidly along the pipe for the purpose of escaping into the ground, but if he merely held up his thumb, as the animal approached the aperture, it stopped, and immediately retraced its steps, so that by this simple action it was as completely imprisoned as if fastened up with a grating.

The common Mole is a native of Europe and the temperate parts of Russia and Siberia, as far as the river Lena; it is found also in Upper or Northern Italy, and though its definite southern limits are not ascertained, it does not appear to have been met with in Lower Italy. It is said also that Moles are not found either in Iceland, Orkney, or Zetland.

The burrows which the Mole forms, taken together, are called its *encampment*, which are divided into several parts—its *lodge* and *runs*, together with its *hunting grounds*, and its *nest*, for the rearing of its young; but on these we cannot here enlarge.

The Mole is most active, and casts up more earth immediately before rain, and in winter before a thaw, as at these times the worms and grubs begin to move towards the surface; but on the contrary, in very dry weather, it seldom or never forms any hillocks, but burrows deeply after its prey, which at that time also buries itself deeply.

It is generally stated that Moles do not make any winter store; Jesse, however, was informed by a mole-catcher, "that previous to the setting in of winter, the Mole prepares a sort of basin, forming it in a bed of clay, which will hold about a quart. In this basin a great quantity of worms are deposited, and in order to prevent their escape they are partly mutilated, but not so much so as to kill them. On these worms the Mole feeds during the winter months.

With reference to the injury or benefit derived from the operations of the Mole there has been and still is much dispute. Le Court considers they do great mischief, not only from their reaping the young corn whilst in the blade to line their nests, at breeding time, but also by the damage they do to the finer roots of trees and other vegetables and grass. On the other hand, Mr. Jesse says, "I have been assured that where old mole-hills are most abundant on sheep pastures, the latter animal is generally in a healthy state, and feeds on the wild thyme and other salubrious herbs which grow on these heaps of earth. When these have been levelled and cleared away,

sheep are not found to thrive as well as they did previously. This fact was confirmed to me by Mr. Hogg, the Ettrick shepherd, who deprecated the practice of removing mole-hills. In Leicestershire, where old mole-hills are extremely abundant in the fine and extensive pastures which are to be found in that county, sheep thrive well, and are generally healthy."

Occasionally, however, they do very great mischief, as when they pierce embankments so as to render them leaky. An instance of this kind occurred in France in 1800, and a rich extensive district was near being destroyed by inundation, from which it was only saved by Le Court's knowledge enabling him to fix on numerous colonies of Moles, which, having established themselves in the banks, had damaged them so much as to prevent their keeping out the water.

The *Blind Mole* (*T. Cæca*) inhabits Tuscany, the centre and south of Italy, part of Southern France, and, from the comparison with Aristotle's description of his *ἄσπᾶλαξ*, it cannot be doubted that this is the indigenous Mole of Greece.

At a little distance below the surface, the Blind Mole scoops out long winding passages, communicating with each other; and in the course of its work forms air-holes, throwing out the earth from below at particular hours of the day in the shape of little conical heaps, which stop the growth of the surrounding herbage, by disturbing their tender roots and depriving them of their proper nourishment. They inhabit fields, kitchen-gardens, and vineyards, because such soil suits their operations, but are never found in hard bottoms nor in rocky districts, nor in places liable to inundation. They change their quarters with the seasons, proceeding to more elevated localities during the rainy season, but returning to the valleys in summer. They produce twice a-year four or five young at a litter, between March and August, which they tend with the greatest care, placing them on a bed of dried grass and fine roots in a rather spacious chamber above the level of the galleries, the entrance to which is carefully secured with props of earth or woody fibre. Like the common species it is extremely voracious, feeding principally on the larvæ of insects and worms; but it will feed on almost any animal, and attacks those weaker than itself, as the Field Mouse, which it devours alive.

The discovery and description of this species by M. Paul Savi, of Pisa, has set at rest the contending assertions of different zoologists as to the vision or blindness of the Mole, proving that although the common species is capable of seeing, there is yet another which is really blind, and which was doubtless the species known to and described by Aristotle.

The senses of smelling and hearing appear to be, as also in the case of *Sorex Etruscus*, the only guides of the Blind Mole in distinguishing objects; indeed the scent is still more remarkable than in *S. Etrusc.*, for on lifting the animal from the ground in order to examine it, or even when it was moving about spontaneously beneath the herbage, the nostrils were always observed in motion, and whenever it chanced to discover any body which it felt a desire to examine, the movement of the nostrils increased so greatly as to cause the emission of a sound similar in kind, though of course not in degree, to that made by hounds on scent.

CENTETES—the *Tandrek*.—These animals were formerly included among the *Erinacei*; but they differ from them materially in having the incisor teeth in front, whilst the *Erinacei* have two long incisores similar to those of the *Rodentia* in front, with the common incisor teeth behind. The new genus was first instituted by Illiger. With respect to minor differences, they are incapable of rolling themselves so completely into a ball as the Hedgehogs, and they have either no tail or a very short one; their snout is also very long and pointed. They are natives of Madagascar.

The *Silky Tandrek* (*C. Setosus*), which measures from ten to twelve inches in length, is the largest of the species; we have also the *Spiny Tandrek*, or *Asiatic Hedgehog* (*C. Spinatus*), which is about the size of the *Common Hedgehog*, and the *Radiated Hedgehog* (*C. Semispinosus*), somewhat smaller than the last. All these animals live in burrows on the water's edge, where they pass the greater part of their time in sleep during the hotter months; they hunt for food in the mud, and spend more time in the water than on land.

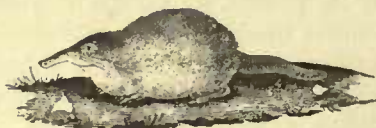
MYGALE—the *Desman*. These animals lead an aquatic life. The form of their skull rather approaches that of the Moles than the Shrews, in not terminating so pointedly; the nasal bones are much elongated, and the gristly part of the nose so much lengthened as to resemble a trunk, and is as moveable as that of the Elephant.

They prefer pools, lakes, and other quiet waters, in the banks of which they form a burrow, the entrance from which is below the surface of the water, and immediately after they work slightly upwards, and form numerous windings to the extent of five or seven feet, so that only part of their habitation is under water: here they live either solitarily, or in pairs, according to the season. They never come to the surface of the water, except at pairing time, when they grow bold, sport upon the banks, and amuse themselves in scrambling among the rushes. They are thought to feed on the roots of the *Nymphaea* and on sweet rush, but Pallas never found anything in their stomach except the remains of larvæ and worms. As they do not become torpid in the winter, they are much inconvenienced by the freezing of the water, and if there be any small apertures in the ice many may be seen anxiously striving to find room to breathe; if they cannot do this, they have only the air in their burrows to consume, and are soon suffocated. They possess a strong musky odour—to such extent, indeed, as to flavour those Pikes and Silures which prey on them.



Nest of Mygale.

One species—the *Musky Shrew* or *Russian Desman* (*M. Moscovitica*)—is eight inches long from the snout to the root of the tail, and the tail is six inches and three quarters. It is found in the Volga, and in the neighbouring lakes from Novogorod to Saratof. Its fur is considered valuable, as, like that of the Beaver, it consists of long hairs, with a fine down at the roots. They are very common near Nisney Novogorod, and sold at the rate of a rouble a hundred. The skins are put into chests amongst clothes to preserve them from moth, and they are supposed to protect the wearers from infection.



Desman.

The *Pyrenean Desman* (*M. Pyrenaica*) is four inches long, tail four and a half. It was discovered by M. Desrouais, in the neighbourhood of Tarbes, at the foot of the Pyrenees.

SCALOPS—the *Shrew-Mole*. This genus was formed by Cuvier upon the individual described by Pennant by the name *Brown Mole*. The animals to which the Shrew-Moles have the nearest affinity in the form and disposition of their teeth is the genus *Mygale*, but the latter are distinguished by having a greater number of false molar teeth.

The number of teeth assigned to the genus *Scalops* is variously stated by different systematic writers. Desmarest only enumerates thirty in both jaws; F. Cuvier and Godman speak of thirty-six; Harlan of forty, and Richardson of forty-four. This seeming difference, however, may be easily reconciled by the well-known fact that the false molars which occupy the place of the cuspid and anterior molars fall out early and at irregular periods, and thus cause the gaps which have been noticed by some writers as characteristics of the genus.

The eyes of this genus are extremely minute, and can scarcely be seen without a good glass. They are entirely hidden by the fur, which, when turned aside, leaves a bare space about as large as a moderate-sized pin's head; in the centre of this is seen a small black speck, shown by the microscope to consist of a number of hairs ranged in a semi-elliptical form, and enclosing an aperture in the skin large enough to admit a fine horse-hair. This is the aperture of the eyelids, and behind it is the globe of the eye, not so large as a mustard seed. The vision of the animal must there-

fore be limited, as the focal distance of such an eye must necessarily be very short.

The *Shrew-Mole* (*S. Canadensis*) measures from the tip of the muzzle to the root of the tail five inches, the tail itself one inch long. When at rest it more nearly resembles in shape a stuffed bag than a living animal, its head being extended nearly to a point, without any auricles, and the eyes so small and completely covered with fur as to escape notice. It is covered with a soft, close-set, glossy fur, half an inch long, of a uniform bright leaden colour, with silvery glossings when viewed in front, but of a darker hue, with purplish reflexions when observed from behind—a variation depending on the incidence of the light. The Shrew-Mole is very common in America between Canada and Virginia; Dr. Richardson considers it does not exist on the east side of the Rocky Mountains higher than 50° north latitude, but thinks it may be found higher up on the milder coast of the Pacific. It is generally supposed that they, as well as Moles, do much damage to the roots of grass and succulent vegetables; but it is probable that the benefit derived from their incessant pursuit and destruction of slugs, worms, and insects, which are injurious to vegetation, is far greater than the damage they cause by disturbing the earth about the roots of herbage.

The strength of the Shrew-Mole far exceeds that which might be expected in so small an animal; Godman mentions that one which he possessed, after escaping from the basket in which it was confined, hurried round the room, and when impeded by the legs of the heavy chairs did not turn aside, but wedging itself between the chair and the wall thrust it off without much apparent effort till it made a free thoroughfare, and finally hid itself behind a large pile of quarto books more than two feet high, which it also moved away from the wall.

They are tamed without much difficulty, and are observed to pass the greater part of the day in sleep, but at night are very active; they do not appear to see in any light, as they uniformly run their nose against every obstacle several times before learning to avoid those which were permanent. When tamed, they may be kept in boxes of loose earth with dried grass for their bed; eat freely of fresh meat, either cooked or raw, drink freely, and follow the hand of their feeder by scent. They eat in a peculiar manner, doubling the flexible snout so as to thrust the food directly backwards into the mouth, and often after receiving anything burrow that they may eat it undisturbed.

Family.—SOLE-TREADERS; *Plantigrada*.

So called because in walking they tread with the whole sole of the foot. The appellation is derived from the Latin *planta*, "the sole of the foot," and *gradus*, "a step."

ILLUSTRATIVE EXAMPLES.

PLATE 5.		
Genera.	Species.	Common Name.
Ursus	Maritimus	Polar Bear.
Procyon	Lotor	Raccoon.
Nasua	Fusca	Brown Coati.
Gulo	Americanus	Wolverine.

Other Genera of this Family:—Meles, Mellivorius.

CHARACTERS OF THE GENERA.

1. **URSUS** (Lat. *a he Bear*). Head somewhat cylindrical; muzzle projecting; snout broad, and, together with the lips, more or less projectile; tongue long and soft; incisive teeth in each jaw six, the outer upper ones stronger and more pointed; cuspid strong and conical; molar teeth four to six in the upper, and four to seven in the lower jaw; of these from one to three in the upper, and from one to four in the lower jaw, small, spurious, and deciduous; the next tooth on each side in each jaw a true sectorial molar, and behind these two very large tubercular teeth of a squarish form; ears of moderate size, and rounded; body bulky, fat, and more or less furred with down at the roots; feet plantigrade, with five

distinct toes; soles bare and callous; claws curved and sharp; two pectoral and four ventral teats; tail short.

2. *PROCYON*, (Gr. *προκύων*). Incisive teeth six in each jaw; cuspid teeth long, conical, and pointed; molar teeth six on a side in each jaw, anterior three cutting teeth, posterior three tubercular, and those of the upper jaw nearly square; muzzle sharp; ears small and oval; tail of moderate length and bushy; feet plantigrade and five-toed; claws sharp and falcular.

3. *NASUA* (Lat. *natus*, a nose). Incisive teeth six in either jaw, the upper outer one on each side sharp and conical; cuspid long, conical, sharp, and angular; molar six on a side in both jaws, the three anterior pointed and cutting, the three posterior tubercular and grinding; muzzle very pointed, nose very long and moveable; ears small and oval; body hairy; tail long and covered with hair; feet plantigrade and five-toed; claws sharp and falcular.

4. *GULO* (Lat. *gula*, gluttony). Incisive teeth, *above*, six; the outer one, on each side, longer than the intermediate, somewhat resembling the cuspid, but more nearly resembling the incisive: *below*, six, the second outer thicker and larger than those in the middle: cuspid teeth long and conical; molar, *above*, in some five, in others four, the two or three anterior having but one point, the last but one the largest, sectorial, with two points on its outer and one tubercle on its inner edge; *below*, six or five molars, the first small, deciduous, the three next single-pointed, the last but one the largest, sectorial, two-pointed, and the last small, tuberculated, and grinding; snout pointed; nose rather prominent and obtuse; ears rounded and short; body airy; tail of moderate length, or short; anal pouch little more than a fold of skin; feet five-toed, plantigrade, soles bare; claws sharp and crooked.

5. *MELES*. Incisive teeth six, both above and below; cuspid longer than the incisive, conical and sharp; molar five *above*, the first very small and deciduous, second and third single pointed, fourth subtricuspid, fifth square, tubercular, and largest of all; six *below*, first small, deciduous, second, third, and fourth single pointed, fifth largest, with two large and one small point on its outer, and two tubercles on its inner edge, sixth small and tubercular; nose prominent and obtuse; ears small and rounded; body hairy; tail short; feet five-toed, cleft; soles naked; claws falcular, those of the fore feet longest and strongest.

6. *MELLIVORUS*. See *Ratel Ratel*, under *GULO*.

PLANTIGRADA.—DESCRIPTION OF THE SPECIES.

URSUS—*Bear*. Although in size equalling the largest of the predaceous animals, the Bears are the least carnivorous of the whole order; and in accordance with this is their system of dentition, for instead of all their molar teeth being sectorial and shutting within each other like a pair of scissors, the crowns of the hinder two in each jaw on each side are tubercular, and their connexion with other carnivorous animals is shown merely by a tooth in front of these, which is only a little more sectorial than the rest. The spurious molar teeth between these and the cuspid are deciduous, sometimes more and at other times fewer, being shed early and leaving corresponding gaps; and in one species at least not all the incisors are permanent. All these circumstances indicate the disposition to frugivorous habits, which is the character of the genus, with the exception of a single species. They are all furnished with projectile lips, some even are capable of great protrusion, so as to form a kind of proboscis. The cartilages of the nose are also very moveable, and participate in this projection. The general aspect of Bears is heavy, their body bulky, limbs thick, and their motions awkward and shuffling upon the ground, although they get along at a tolerably brisk pace; but the greater number of them are better suited for climbing trees, their descent from which is, however, less ready, as they come down breech foremost. The breadth of their forehead, their narrow muzzle, and their generally lively though small eyes, somewhat relieve their otherwise heavy appearance. Bears are extremely cautious, and avoid whatever they are unacquainted with, or, if induced to approach, come slowly towards and examine it with great care before

meddling with it. Generally they are shy and little inclined to fight, except when pressed by hunger, or when in company with their young and attacked. When, however, compelled to act on the defensive, they are very courageous, and little disposed to avoid a rencontre, but rising upon their hind limbs endeavour to hug their opponent in their arms, and tear him to pieces with their teeth and claws. Most of the species inhabiting cold climates retire to dens, where they sleep through the greater part of the winter, and during this time the female produces her young. Bears are capable of a certain degree of education, and can be taught to perform particular motions at the word of command; hence they appear to have been for many ages and in all countries great favourites of the populace, who are amused by their grotesque antics. Where Bears are numerous, they become considerable articles of commerce for the sake of the valuable furs which they afford; and they are either taken in snares or shot, preference being given to the latter method where possible, on account of the danger the hunter is otherwise exposed to: but even shooting is by no means free from danger.

The species are—the *Brown Bear* (*U. Arctos*), which is about four feet in length and two and a half in height. This animal was formerly found throughout Europe as low as the Alps and the Pyrenees, but has long since been extirpated from the British Isles, and from the interior of Holland, France, and Germany; it is, however, still common in the Alps of both Switzerland and Savoy, in the mountain forests of Bohemia, Poland, and Russia, and extends across Asia in great numbers, in Siberia, and as far as Kamtschatka and Japan; perhaps also in America and Africa. Oken says that in their fifth year they mate; the female goes with young seven months, and produces one, two, or three cubs, which are perfectly well formed, and about eight inches long; they remain blind for a month, and continue to suck during three months. Except during the short breeding season they live solitarily, some resorting to their winter retreats, from whence the female does not emerge till her young are able to follow her. They feed generally on pulse, roots, and of potatoes they are very fond; also on berries, and to honey they are extremely partial, in search of which they climb the trees, regardless of the stings of the bees. They also hunt after ant-hills, being very partial to those insects, probably on account of their acidity, as acid fruits, particularly barberries and sorb-apples are great favourites. Occasionally also they prey on cattle and carrion, but this generally after rousing from their winter sleep, when they are very ravenous. At this time, as also when in company with their cubs, they are approached with danger. They live very well upon bread, as upon it alone, to the amount of eight pounds a-day, they are fed in the Garden of Plants in Paris, and also in the public garden at Berne. Bears have lived for forty-seven years upon bread, varied, however, with such unripe fruit as is brought to market, and which, according to the regulations of the town, is confiscated to their use.

The *American Black Bear* (*U. Americanus*) rarely exceeds five feet in length; the head is shorter and narrower, though the space between the ears is wider, and the forehead more arched than in the European Black Bear of Cuvier, though less than in the Brown Bear. This is the smallest species of the American Bears, and inhabits every wooded district from the Atlantic to the Pacific, and from Carolina to the shores of the Arctic Sea; but is more numerous inland than near the coast. Its food consists principally of various kinds of berries; but these failing, it eats roots, insects, fish, eggs, and such birds or beasts as fall in its way; but it does not eat animal food by choice. Those living in the fur countries hibernate in dens, under fallen trees, beneath which they scratch away the soil, and, retiring to it at the commencement of a snow-storm, are soon covered up. But in more southern districts, where the timber is larger, a hollow tree becomes their winter residence; and in either case there they remain till the greater part of the snow is gone. The cubs are produced in the beginning of January, from one to five in number, probably according to the age of the parent; who though at other times very timid, yet at this period is fierce and dangerous. According to Henry's account, the female does not, like the male, reside in a den; but so soon as her cubs are able to

climb, mounts up with them into the upper part of a tree, and there remains through the winter, by which her offspring are secure from the attacks of wolves or other animals. The native tribes of North America have great veneration for the Bear—only attack it after certain ceremonies, and even when dead make an exculpatory speech for the violence they have committed in destroying it.

The *Grisly Bear* (U. Cinereus) is the largest of the genus, measuring nine feet in length, and even more, and said to exceed eight hundred pounds in weight. This species inhabits the Rocky Mountains, and plains to their eastward, extending as high as 61° N. lat., and perhaps higher; southward they are found as low as Mexico; but, according to Drummond, they are most numerous in the woody districts on the eastern base of the Rocky Mountains. The Grisly Bears are carnivorous, but also occasionally eat vegetables, and are very fond of the roots of some species of *Psoralea* and *Hedysarum*, and also the fruits of the bird cherry, choke cherry, and *Hippophae Canadensis*. The pregnant females and young animals hibernate in dens, of which Mackenzie mentions one ten feet in width, five feet high, and six long; but the old males often come out during winter in search of food, and, from their great weight, their footsteps are often marked by the cracking and sinking of the crust of snow to the extent of a yard or more around the spot on which they have trod. Their ferocity is very great, and they are so powerful as to be able to drag the carcase of a buffalo, weighing about a thousand pounds, to a considerable distance.

The *Juggler Bear* (U. Labiatus) measures nearly five feet in length, and two feet eight inches in height at the shoulders; the lips long and thick, of which the lower is longest, and capable of projection, retraction, and lateral motion. This great length of the lips especially, together with the presumed deficiency of the incisive teeth, led Illiger to form of this species his genus *Prochilus*. The general colour is deep shining black, excepting the snout, and a spot above each eye, which are yellowish-white; upon the chest is a V-shaped patch of the same colour, the branches of which rise up towards the neck. This animal is found in the sand-hills at Patna in Bengal, and also in the mountains of Silhet, usually in pairs, with one or two cubs, which, when in danger, mount on their dam's back. In the Mahratta country it is known by the name *Assail*; and, being more intelligent and docile, is educated and carried about for the amusement of the populace by the jugglers; hence the specific name applied to it by Fred. Cuvier. It burrows with its claws, and lives in caverns; feeds on white ants, also on honey, rice, and the fruit of the palm, *Borassus Flabelliformis*. In confinement it appeared to be gentle and good-natured; but when irritated, uttered a short abrupt roar, ending in a whining tone, expressive of impatience. It was moderately lively, and had a habit of turning itself frequently round, as if for amusement, like a dog about lying down to sleep.

The *Malay Bear* (U. Malayanus) is three feet eight inches in length; head short, conical, very gradually attenuated, obtuse, and broad between the ears. According to Blainville, the skull of this species is as round as that of a cat. General colour jet black, excepting the muzzle, before the eyes, which is dusky-grey, and a white semilunar mark, with its branches extending on the sides of the chest. Is a native of Sumatra; and Sir Stamford Raffles says, "When taken young they become very tame. One lived two years in my possession. He was brought up in the nursery with the children; and when admitted to my table, as was frequently the case, gave a proof of his taste by refusing to eat any fruit but mangosteens, or to drink any wine but champagne. The only time I ever knew him out of humour was on an occasion when no champagne was forthcoming. It was naturally of a playful and affectionate disposition, and it was never found necessary to chain or chastise him." This species is known to the Malays by the name of the *Bruang*.

The *Bornean Bear* (U. Eurypilus) measures three feet nine inches in length; its skull, in comparison with that of other Bears, is of great size, its contour above nearly hemispherical, and on the sides it expands obliquely outwards. The gape of its mouth is considerable, and the animal frequently opens its jaws widely as if yawning, thrusting out its long, narrow, slender tongue to the length of a foot. The neck is short and

thick; the body cylindrical and bulky, abruptly rounded towards the stout short thighs, whilst the anterior limbs are more long and slender. The tail is about two inches in length, of which one-half consists of a tuft of stiff hairs extending beyond the bone. The claws are very long, strongly arched, somewhat grooved beneath, rounded above, narrow at the base, and gradually tapering towards their tips, which are transversely truncated. The fur is short, closely applied to the skin, and rather rigid, with scanty down at the base; very short on the forehead, and gradually rising to the crown, where they are dense, nearly erect, and very soft. The general colour is glossy deep black. This species is a native of Borneo.

The *Polar Bear* (U. Maritimus) is from seven to eight and a half feet in length, and from four feet three to nine inches in height. It is characterised by the narrowness and flatness of its skull, from which the forehead and profile of the face run in a nearly straight line to the thick muzzle (Plate 5). The fur, which is yellowish-white, is very thick, long, fine, and woolly on the hinder parts, belly, and legs, but short and even upon the head, neck, and upper part of the back; the soles are almost completely covered with long hair, and the thick short black claws are but slightly curved. The naked extremity of the muzzle, the margins of the eyelids, and the tongue black; the lips purplish-black, and the inside of the mouth pale violet; eyes brown. The Polar Bear is a native of the Arctic Regions, and has been found in higher latitudes than any other quadruped, having been seen by Sir Edward Parry as high as 82° N. lat. They descend southwards as low as the 55th parallel. The Polar Bear never resorts to the woods, as do other Bears, except when it accidentally loses its way in the fog, but constantly lives upon the sea-coast or upon the ice-fields, with which it is not unfrequently drifted far from land, and thus often transported from Greenland to Iceland and Norway, where it commits great ravages amongst the flocks. It is fearless of cold, and seems indeed to enjoy itself most when the cold is most severe. It swims, makes long leaps in the water, and dives extremely well. The Polar Bear is carnivorous, and feeds either on the floating carcasses of dead whales and fish, or on living seals and other marine animals, and even on the Walrus. Their scent is very fine, and they are often attracted from a great distance by the smell of turning kreng or refuse of whale blubber. Both Graham and Hearne say that the he Bear wanders about the marshes and adjacent parts till November, and then goes out to sea, and preys upon seals, whilst the female retires under the declivity of a rock or the foot of a bank, not unfrequently thirty miles from the sea, where the snow soon drifts over her to a great depth; a small hole, however, being left at the dome of the den for the admission of air. There she remains from December to March without food, and about Christmas produces two cubs. They are led down to the sea-side by their dam to feed on seals and sea-weed; and when tired, are safely borne upon their parent's back. In the course of the summer they become very fat, as much as a hundred pounds of fat being occasionally taken from a single beast. The Greenlanders feed on their flesh, which is coarse and white, and has somewhat the flavour of mutton. The skin is used for making seats, boots, shoes, and gloves, and the tendons, when split, serve for sewing threads.

There are also the *Thibet Bear* (U. Thibetanus), found in the mountains of Nepaul and Sylhet; and the *Cordilleras Bear* (U. Ornatus), found in the Cordilleras, of which we can take no further notice in this place.

PROCYON—Raccoon. This genus, formerly included among the Bears, are distinguished from them by the regular series of their teeth; the anterior three molars, which in the Bears are of irregular size, at unequal distances, and often deciduous, being in the Raccoons placed regularly behind each other, and gradually running from the form of cuspid into that of the last three or true molar teeth. In this arrangement of the teeth they resemble the Coatis (*Nasua*), but are distinguished from them by the shortness of the muzzle, which is hardly at all moveable, by the shortness of the head and its great width behind, and also by their short bushy tail. Their limbs are slender, but the paws strong; the fur on the body long, thick, and loose, but on the head and limbs short. Two species only are known, and both are from America.

The *Common Raccoon* (*P. Lotor*) is about two feet in length; the general colour of the fur dusky grey, inclining to black on the upper parts, but becoming lighter on the sides and whitish on the belly; face whitish, surrounded by a black band of unequal width. Is found most frequently in North America. The Raccoon is a very lively, active animal, and in confinement is capable of slight attachment, which, however, it speedily forgets when set at liberty. It feeds on vegetable substances, especially on fruit, and also upon eggs and the birds themselves, and is said to be very dexterous in extracting oysters from their shells. It feeds itself with its fore paws like hands, not unfrequently sitting up on its rump, and has a remarkable disposition to plunge everything it eats into water, when it has an opportunity.

The *Crab-eating Raccoon* (*P. Cancrivorus*) is of a tawny colour, mingled with black and grey. Its habits are similar to those of the last species, and it feeds on crustacea. It is found in South America, and especially in French Guiana.

NASUA—Coati. These animals are remarkable for the elongation of the nose, which is extended into a kind of trunk, pierced at the tip by oval nostrils. In size they nearly equal the Fox; the body is long and covered with thick hair, the legs are short, and the tail, about equalling the length of the body, is carried either horizontally or elevated. They live in the woods, either alone or in pairs, but do not burrow. They feed on fruit, insects, and reptiles, which they hunt by scent; and they grub up the earth with their long snout like Hogs. They are easily tamed, and fond of caresses, but never attach themselves, and cannot be allowed to go at liberty, as they pry into every hole and corner where they have the least notion anything is to be obtained.

The *Red Coati*, or *Brazilian Weasel* (*N. Rufa*), measures in the length of the body about fifteen inches, tail fourteen, general colour bright rufous. It inhabits Brazil and Guiana, and climbs trees with great facility; it carries its tail perpendicular to the body, and puts it between its legs before going to sleep.

The *Brown Coati* (*N. Fusca*), shown in our fifth Plate, is the same in size as the Red Coati; its general colour is blackish brown, mingled with a little grey on the upper parts of the body; dingy yellow beneath, especially on the neck and chest between the fore legs; the head is grey, the sides of the nose black, bordered on the upper edge with two white stripes, which pass from the angle of the eye to the middle of the snout, where they are gradually lost; above and below each eye is a white spot, and a third behind the outer corner; the tail is alternately ringed with black and dingy yellow. It is found in Brazil, Paraguay, and Guiana, climbs as well as a cat, and is extremely troublesome from turning over everything which comes in its way.

GULO—Glutton. This genus forms a link between the Plantigrade and Digitigrade tribes. In disposition they are bloodthirsty and cruel, and most of them are northern animals.

The *Ursus Gulo* (*G. Septentrionalis*) is about the size of our Badger; the limbs large, back straight, and marked through its whole length with a tawny line, the rest of the body either black or a deep chestnut; tail short and very hairy. Native of Lapland, Eastern Siberia, and Kamtschatka, in which latter country it often varies in colour to white and yellowish; such skins are more valued by the natives, who have a notion that the heavenly beings are clad with them. Its victims are chiefly Deer.

The *Wolverine* (*G. Americanus*) is considered by Pallas to be a variety of the last species; it usually walks with the back arched: white spot on the throat and chest, the latter crescent-shaped; a yellowish-brown band on the sides passing over the back above the tail. Found at Hudson's Bay and in Canada, where it is called the Beaver-eater, in consequence of preying on those animals. Is very fierce and powerful, but slow-footed, and has a musky smell, which causes its preservation from other predaceous animals.

Besides the Wolverine, the *Grison* (*G. Vittatus*), and the *Guiana Glutton* (*G. Barbarus*), are natives of America.

The *Ratel Ratel* (*G. Mellivorus*), considered by some as a distinct genus, is about the size of the Badger, with short legs and long straight claws.

Found at the Cape of Good Hope, where it inhabits the deserted holes of other predaceous animals: it feeds on Bees, to whose nests it is directed by the Honey-guide Cuckoo, but fails of disturbing them when lodged in the trees, as it cannot climb. It is courageous, and will often not only face, but resist, a pack of Dogs which would destroy a Lion. It emits a most horrible stench.

MELES—Badger. The individuals belonging to this genus were included by Linnæus among the Bears, from which, however, they are especially distinguished by the form of the molar teeth, the three hindmost of which in the Bears are all tubercular.

The *Common Badger* (*M. Vulgaris*) is about two feet six inches in length, and the tail six inches more; it stands low on the legs; the body clumsy, thick, and covered with long, coarse hairs like bristles, which have generally a greyish appearance.

The Badger is a harmless and inoffensive animal, spending the greater part of its time in sleep; it burrows under ground, and forms several cells, with, however, but a single entrance; here in the summer the female brings forth her young, depositing them on a bed of grass and moss. It is not decided whether they are carnivorous, or whether, like the Bears, they only feed on animal food, when roots, fruit, and grass, believed to be their common sustenance, is not to be found. In their motions they are slow, but when attacked fight furiously and bite severely.

The Badger is found principally in Europe, but it is also met with in the northern parts of Asia, though not in hotter climates. The skin of the Badger is commonly used for pistol furniture, and among the Highlanders of Scotland for pouches; the hairs are also employed for making that kind of brush used in painting for softening down, which are called sweetening tools. In China they are commonly used for food.

Badger-baiting is now scarcely heard of, though formerly it was a very fashionable employment.

The *American Badger* (*M. Labradorius*) is of less size than the preceding and of lighter make, and the head, though as long, is not so sharp at the nose; its fur is very fine, about three and a half inches long on the back, and of purplish-brown colour. The American Badger frequents the sandy plains skirting the Rocky Mountains as far as the banks of the Peace River and the source of the River of the Mountains, and is very common in the plains of the Missouri, as also near Carlton House, on the banks of the Saskatchewan and Red River flowing into Lake Winnipeg.

Family—TOE-TREADERS; *Digitigrada*.

The animals of this family are characterised by treading on the ends of their toes, on which account they are named as above. *Digitigrada* is composed of the Latin *digitus*, "a toe or finger," and *gradior*, "to walk."

ILLUSTRATIVE EXAMPLES.

Genera.	Species.	Common Name.
<i>Mustela</i> - - - -	<i>Fouina</i> - - - -	Pine Martin.
<i>Mephitis</i> - - - -	<i>Americana</i> - - - -	American Skunk.
<i>Lutra</i> - - - -	<i>Vulgaris</i> - - - -	Common Otter.
<i>Viverra</i> - - - -	<i>Civita</i> - - - -	Civet.
<i>Herpestes</i> - - - -	<i>Ichneumon</i> - - - -	Egyptian Ichneumon.

PLATE 7.		
<i>Canis</i> - - - -	<i>Familiaris</i> - - - -	Thibet Dog.
	<i>Lupus</i> - - - -	Wolf.
	<i>Aureus</i> - - - -	Jackal.
	<i>Vulpes</i> - - - -	Fox.
	<i>Fennecus</i> - - - -	Fennek.

PLATE 8.		
<i>Hyæna</i> - - - -	<i>Vulgaris</i> - - - -	Striped Hyæna.
<i>Felis</i> - - - -	<i>Leo</i> - - - -	Lion.
	<i>Tigris</i> - - - -	Tiger.

Other Genera of this Family:—*Megalotis*, *Paradoxus*, *Proteles*.

CHARACTERS OF THE GENERA.

1. **MUSTELA.** Incisive teeth six in each jaw; the second lower outer one narrower, and set further in than the others, cuspid, sharp, conical, and

large; molar in the *upper* jaw on each side four or five, of which the anterior two or three are sectorial and slightly conical, the last but one the largest, sectorial, tricuspid on the outer edge, and on the inner having a little distinct tubercle; the last a transverse, tubercular grinder; in the *lower* jaw five or six, the first small and deciduous, the following two or three sectorial and conoid, the last but one the largest, sectorial, and tricuspid, the last point being very little elevated and increased by a little posterior process, the last a small, circular, tubercular grinder.

2. **MEPHITIS.** Incisive teeth six above and the same number below, of the latter the second on each side placed rather behind the others; cuspid long, conical, and apart; molar, four above, the first two or false molar conical and compressed, the third or carnivorous tooth widened on its inner edge by a tubercle, the fourth, or tubercular, square, and having four tubercles on its crown; five below, the first three conical and compressed, the fourth, or carnivorous, increased on the inner edge by two tubercles, the fifth small; snout shorter than the skull; ears small and rounded; body covered with long fur; tail long or short; feet five-toed; soles hairy; falcular claws, those of the fore feet the longest, and fit for digging.

3. **LUTRA** (Lat. *lutum*, mud). Incisive teeth six above, six below, of which the second outer is the narrowest, sometimes only four; cuspid conical, sharp, and longer than the incisive; molar above five on a side, the anterior three or two conoid and cutting, the next to these the largest with a broad, internal, lateral rising; the last tubercular; below, six or five, the first small, the two following conoid and cutting, the last but one cutting with two points, the last tubercular; the head flat, nose short and broad; ears short; eyes furnished with a law; body covered with long close hair; tail short and flattened horizontally; legs short and muscular; toes five on each foot, webbed; claws sharp and falciform.

4. **VIVERRA.** Incisive teeth in each jaw six; cuspid teeth conical, long, and distinct; molar six on each side in each jaw; in the *upper*, the anterior three sectorial, conoid, and slightly compressed, the fourth sectorial very large and tricuspid, the hinder two tritorial and tubercular; in the *lower* jaw, the anterior four sectorial and single-pointed (the first tooth sometimes deficient), the fifth largest, sectorial, its outer edge bicuspid with two internal tubercles, and one large hinder tubercle, the sixth large, tritorial, and tubercular; muzzle lengthy; tongue beset on its upper surface with sharp, coarse papillæ; ears short; body covered with long hair more or less coarse, with finer short hair, or down, at the base; tail long, tapering, or cylindrical; feet digitigrade, with hairy soles, with five distinct toes, and the claws curved, sharp, and more or less retractile; between the vent and the genitals a glandular apparatus secreting an odorous, unctuous substance.

5. **HERPESTES** (Gr. *ἐρπῆστης*, a creeper). Six incisive teeth in each jaw, the second outer, on each side of the lower, narrower than the others; cuspid teeth sharp, conical, longer than the incisive; molars six on each side in each jaw; of the upper, the anterior three are compressed and cutting, the fourth tricuspid, and the fifth and sixth tubercular; of the lower, the first four are single-pointed and cutting, the fifth largest and cutting with two points on its outer, and two tubercles on the inner edge, behind which is a broad surface, having four tubercles on it; the sixth molar large, tubercular, and grinding; muzzle sharp, with a lengthened rounded snout; ears short and rounded; body long and covered with long hair, except the head and legs, on which it is short; tail long; anal pouch large, but single, and immediately beneath the tail; the vent placed in its deepest part; the legs short, five-toed, and half-webbed; claws sharp; the whole sole bare, but the animal walks only upon the tips of the toes.

6. **CANIS** (Lat. *catus*, wary). Three false molar teeth above and four below on either side; two canine teeth in either jaw, behind each of which are two tuberculous teeth, of which the anterior in the upper jaw are very large; tongue very soft; five toes to the anterior, and four to the hinder extremities.

7. **HYÆNA.** Incisive teeth six in each jaw, the second outer of the lower jaw thicker at its base than the others; cuspid very long, conical, and sharp; molar teeth large, five on each side in the *upper* jaw, the anterior three single-edged, the fourth, which is the largest, tricuspid, and armed

with a little tubercle on its fore and inner edge, the fifth small, tubercular, and placed transversely in the jaw; in the *lower* jaw four, the anterior three thick and conical, the fourth the largest and bicuspid; feet four-toed, their soles hairy.

8. **FELIS.** Muzzle round; jaws short and strong; incisive teeth six in each jaw; cuspid very long, conical, sharp; molar teeth cutting, four on each side in the upper jaw, the two first thickish and conical, the third which is the largest bicuspid, and the fourth tuberculated and smallest; in the lower jaw three, the anterior simply cutting, the third bicuspid; tongue rough, with little points inclining backwards; pupils in some round, in others oblong vertically; ears short and pointed; body hairy, tail varying in length; feet digitigrade, five-toed before, four-toed behind, soles hairy; nails sharp clawed, and in most species retractile upwards, the roots entering into sheaths.

9. **MEGALOTIS** (Gr. *μέγας*, great, and *οἶς*, an ear). Incisive teeth above and below; cuspid teeth very long and sharp pointed; molar teeth six above and seven below on either side; ears very long, oval, and open; fore feet five-toed, hind feet four-toed.

10. **PARADOXURUS** (Gr. *παράδοξον*, a paradox, and *οὐρά*, a tail). Incisive teeth six in each jaw, of which the external are the larger, cuspid distinct, conical, and larger than incisive; molar six above and below, the anterior upper three and lower four spurious, the fourth upper and fifth lower sectorial, and the rest tubercular; muzzle long and nose projecting; ears rounded; feet five-toed, and the toes connected by a loose membrane as far as the last joint, the claws sharp and partially retractile; at the roots of the toes four fleshy tubercles covered with delicate skin; tail long, capable of being rolled up into a spire; anal pouches none.

11. **PROTELES** (Gr. *πρὸ*, before, and *τελής*, perfect). In each jaw six incisive teeth, regularly ranged, broadish, grooved vertically in front. Those of the lower jaw bilobed on their crown; cuspid teeth rather longer than the incisive, and conical; molar teeth eight in the upper jaw apart from each other, and six in the lower jaw; muzzle slender and nose projecting; ears long and sharp; fore feet five-toed, hind feet four-toed, plantigrade; claws falcular and sharp; tail of moderate length.

DIGITIGRADA.—DESCRIPTION OF THE SPECIES.

MUSTELA—*Marten, Polecat, Weasel.* The animals which compose this genus are distinguished from all other of the Carnivorous Family by the length and slenderness of their bodies and the shortness of their legs; their neck is strong and thick; their body and limbs are extremely supple, so that they twist about like worms, whence they are called *Vermiform Animals*. All have anal glands, the secretion from which, in the Polecat, Weasel, and others, is extremely offensive, whilst in some, as the Marten and Pine Marten, it affords an agreeable perfume. They live a solitary life, some in the neighbourhood of human habitations, others only in forests, or near the brinks of streams. All of them are extremely sanguinary. These animals are found in all parts of the world, but more especially in the temperate and colder Northern regions, where their fur becomes extremely fine and thick, and in Norway and Siberia forms an extensive article of commerce.

The first section of these animals includes the following species:—

The *Polecat*, or *Fitchet* (*M. Putorius*), which is about eighteen inches in length; its tail is six inches. It lives in woods or thick brakes, either in old rabbit burrows or forming a shallow burrow about two yards long, which usually terminates amid the roots of trees; sometimes it is found under hay-ricks and in barns, and in winter occasionally even in houses. It brings five or six young at a birth, and these, towards the end of the summer, are capable of providing for themselves. The Polecat steals out at night, and is but rarely seen in the day-time; it is a great enemy to young poultry and game, especially Rabbits, the blood of which it is extremely fond of. Though the smell of the Polecat when alive is so rank as to be proverbial, yet its skin, when dressed with the hair on, is used as fur for making tippets.

The *Ferret* (*M. Furo*) is by some zoologists considered as merely an

albino variety of the Polecat; its length is fourteen inches, and the tail five; the head is narrower, and the nose sharper than in the Polecat; its colour is pale or whitish-yellow, and the eyes red and fiery. They are easily tamed, but are very soon irritated, and when angry are very apt to bite severely. As they suffer much from cold, they require to be kept in boxes filled with wool. They are never found wild in England.

The *Sarmatian Weasel* (*M. Sarmatica*) is in its general form similar to the Polecat. It is very voracious, commonly lives in deserted holes of other animals, is very active, moving along by jumps; is fierce, untamable, and watchful; is said to bring four or eight young at a birth.

The *Siberian Polecat* (*M. Sibirica*) is of a more slender form than the Polecat, and rather resembling that of the Stoat; is about twelve inches long, and the tail six; the general colour is deep yellow, approaching to fox colour; tail full of hair, and darker than the body; soles of the feet thickly covered with fur; the fur is longer and coarser than in the Polecat.

The *Stoat* or *Ermine* (*M. Erminea*) is about ten inches long, the tail five inches, and tipped with black; the edges of the ears and tips of the toes yellowish-white, upper parts of the body reddish-brown, throat, breast, and belly, white. Such is its summer coat, and it is then called by the French *Roselet*, whilst we distinguish it by the name *Stoat*. But in winter it becomes white, except the tip of the tail, which retains its black colour, occasionally in England, but always in higher northern latitudes; it is then called the *Ermine*. In manners it resembles those of the Common Weasel.

The *Common Weasel* (*M. Vulgaris*) measures about six or seven inches in length, its tail two and a half more, and its height two and a half inches. During winter it becomes white in the fur countries, and is not distinguished by the traders from the Ermine. The Weasel readily takes up its residence, during winter especially, near habitations, for the purpose of living on poultry-yards and dove-cots; but in warmer weather it retires to plantations, where it makes its nest either under the roots or in the hollow of a tree; it brings four or five young at a time, which are found in spring hidden in a bed of straw or stubble. The Weasel may be tamed so as to feed out of the hand, and follow like a dog; it soon learns to know persons, and will lick the hand which feeds it.

Besides these there are—the *African Weasel* (*M. Africana*); the *Striped Weasel* (*M. Striata*), found in Madagascar; the *Naked-footed Weasel* (*M. Nudipes*), native of Java; the *Zorilla*, of the Cape of Good Hope; and the *Jackash*, or *Vison Weasel*, which is common throughout the whole breadth of the American continent. The Vison lives much in the water, and when pursued prefers sheltering itself there to endeavouring an escape by land, on which it moves but slowly; its short, smooth fur, Otter-like tail and short legs, point out its aquatic habits. When irritated it emits a smell nearly as fetid as that of the Skunk. The Vison is easily tamed, is fond of being caressed; but is very easily offended, and will then bite sharply.

The second division of this genus includes the several species of Martens:—The *Marten* (*M. Martes*) is about eighteen inches long, and the tail ten more; the head is of a more elongated form than in the Weasels; claws white, large, and sharp, well adapted for climbing trees, in which it here constantly lives. The colour of the Marten varies to ash according to its age and the different seasons in which it is taken. The skin of the Marten has a fine musky smell. It lives solitarily in the woods and never approaches habitations; but deposits its young either in the nests of birds, or in the *drays* or nests of Squirrels, and in winter very often shelters itself in Magpies' nests. It brings four to six young at a birth, which as they grow it feeds with fresh eggs and live birds, which it brings to the nest. When taken young, it is easily tamed. Poultry, game, and small birds, are its common food. The Marten is the most handsome of our indigenous beasts of prey; its motions are very elegant and nimble, and its eyes lively.

The *Pine Marten* (*M. Foina*) is about twenty inches in total length, eight of which belong to the tail; all the upper parts are yellowish-brown, but the head is paler; tips of the ears and cheeks white; throat and breast yellow; tail bushy, and of a deeper colour than the body. It is very rare in England, but in Scotland, where it inhabits the pine forests, it is, according to Pennant, the only one known. It prefers cold to warm regions,

hence it is very common in the north of Europe, and especially in North America, but it does not extend further north than 68° latitude, where the woods cease. The Pine Marten feeds on Mice, Partridges, and Hares, and it often destroys the stores of meat and fish laid up by the Indians. When pursued and unable to escape, it sets up its hairs, arches its back, shows its teeth, and makes a hissing noise like the Cat; will seize a Dog firmly by the nose and bite so hard, that a Dog, unaccustomed to it, will allow its escape. They burrow in the ground, and bring from four to seven young at a litter towards the latter end of April. The fur of the Marten is fine, and often dyed to imitate sables and other costly furs. (Plate 6.)

The *Sable* (*M. Zibellina*) is in size equal to the Marten, but differs from it in some few particulars. Its coat is generally brown, sometimes tawny, and occasionally quite white. They are found in Siberia, Kamtschatka, and some of the Kurile Islands between the latter country and Japan. Their furs form a very valuable article of commerce, and are worth from one to ten pounds apiece.

One of the modes adopted by the hunters for taking the Sable is as follows: a piece of timber is placed horizontally between two trees, and upon it another aslant, and slightly supported at one end by a pole, from which extends a rod to which a bait is attached; this when meddled with disturbs the whole apparatus, and the slanting board falls and kills the animal. The first Sable taken is dedicated to the Church, and is called God's Sable.

It does not appear that the Greeks or early Romans ever made use of furs; but about the year of our Lord 522, when Totila, King of the Visigoths, reigned in Italy, the Senthons, a people of modern Sweden, found means of transmitting to the Romans the precious skins of Sables. Furs were subsequently used for lining the tents of princes; and in 1252, Marco Polo found those of the Cham of Tartary lined with Ermines and Sables. In Wales, furs were highly esteemed so early as the time of Howel Dda, who began to reign in 940. In the following century furs became still more fashionable, and when Godfrey of Bulloign, and his followers, on their way to the Holy Land, appeared before the Greek emperor Alexis Comnenus, he was struck with the richness of their dresses. In England, as elsewhere, this disposition for wearing fur increased to so great an extent that, in 1337, it was enacted by Edward III. that no person should make use of it unless he could afford to spend a hundred pounds a year.

The *Pekan* (*M. Canadensis*) is also valuable for its fur; it is found from Pennsylvania to the Great Slave Lake, and probably across the American continent. Considerable numbers of the skins of this animal are annually sold by the Hudson's Bay Company under the name of *Woodshocks* or *Fishers*. How the Pekans have gained the latter title it is not easy to imagine, for they are not amphibious, and feed only on the smaller animals.

Several other species are enumerated by Linnæus, Buffon, and Pennant.

MEPHITIS—the *Skunk*. The animals forming this genus have a general resemblance to the *Putori*; and they are remarkable for ejecting a most intolerably fetid odour, which is their best safeguard against the attacks of other animals. They are predaceous and live in burrows.

The species are—The *Striated Skunk* (*M. Putorius*), about the size of the European Polecat. The horrible stench which they emit renders them almost impregnable, as few others, except dogs bred for the purpose, dare encounter it.

The *White-tailed Skunk* (*M. Chincha*), of which Plate 6 contains a representation, is found from Hudson's Bay to Peru, where it is called *Chinche*, and in Peru, *Conepatl*, or Boy's little Fox. Its general colour is brown more or less deep, marked on the shoulders and belly with two little white spots. Mr. Darwin saw some of these animals. In his "Journal" we find the following:—"We saw also a couple of Zorillos or Skunks—odious animals, which are far from uncommon. . . . Conscious of its power, it roams by day about the open plains, and fears neither dog nor man. If a dog is urged to the attack, its courage is instantly checked by a few drops of the fetid oil, which brings on violent sickness and running at the nose. Whatever is once polluted by it, is for ever useless. . . . Certain it is that every animal makes room for the Zorillo."

LUTRA—the *Otter*. The animals of this genus are piscivorous, and live

on the banks of rivers. Of the species we may mention—the *Great Otter* (*L. Vulgaris*), which is about three or four feet in length; of a long and slender make, flat forehead, limbs short and muscular, feet broad and webbed, fur close and of a shining deep brown. (Plate 6.)

Otters feed entirely on fish, to which they are very destructive, as they rarely devour further than the vent and leave the tail part untouched. Occasionally, however, when fish is scarce, they leave their usual haunts, and, proceeding inland for some distance, destroy poultry, sucking pigs, lambs, and even rabbits. They have been occasionally known to feed on the bark of trees also, and on vegetables. The Otter brings four or five cubs at a birth, about June, and these, if taken young, may be brought up, as has been done, by suckling from a bitch, and tamed. Many instances of this kind have occurred, and the Otter taught to fish for his master. (See "Daniel's Rural Sports.") The Otter is found throughout Europe, also in the northern parts of Asia, in Chili, and North America, especially in Canada, whence the finest skins are obtained.

The *Brazilian Otter* is larger than the Common Otter.

The *Lesser Otter*, a third of the size of the Common Otter, is found in Poland and the north of Europe, and in North America, where it is called the *Minx*, as in Sweden it is named *Mänk*. Its fur is very valuable, and nearly equals the Sable in beauty. It is taken in traps or with dogs.

The *Sea Otter* (*L. Marina*) measures from four to five feet in length; fur long, velvet-like, and deep, glossy black, sometimes varying to silvery; are very harmless, and show great affection to their young, carrying them, before they can swim, in the water on their paws, and pining to death if bereft of them. They are hunted for their skins, which are very valuable, often fetching in China a hundred rubles apiece.

VIVERRA—the *Civet*. The animals forming this genus are light, elegant, and slender animals, having the papillæ of their tongue covered with sharp, horny skin, like the Cat genus; but their most remarkable character is the glandular apparatus at the rump, in which is secreted the peculiar odorous substance called civet, which in some species consists of two deep pouches, and in others presents a simple cleft.

The species are arranged into two divisions, namely, the *True Civets* and the *Genets*. Of the *Civets* we enumerate—the *Civet Cat* (*V. Civetta*), which is about two feet and three inches in length from the muzzle to the root of the tail, and the tail fourteen inches; the fur is from four to five inches in length, and capable of erection like a mane; muzzle lengthy, and lips furnished with long moustaches; ears short and rounded; colour of the back and sides brownish or yellowish-grey, with rows of large dusky spots; tail either wholly black, or spotted only at its base. (Plate 6.) The Civet is a native of the hottest parts of Africa, and prefers sandy and dry mountainous districts. Civet is obtained from these animals, which are kept in confinement for that purpose, the secretion being removed occasionally from the subanal pouch as it collects.

The *Zibet* (*V. Zibetha*) is a native of the Asiatic continent from Arabia to Malabar, and of the large islands of the Indian Archipelago. By the Malays it is called the *Tangalung*, and is often kept by them in a state of partial domestication; its habits and degree of tameness resembling that of our domestic Cat.

The *Rasse* (*V. Indica*) is of a more lengthy and slender form than the other species. It occupies in Java the station of the Civet and Zibet elsewhere; and it is kept in cages by the natives for the sake of its perfume, and fed on mixed diet of eggs, fish, flesh, and rice, but its naturally ferocious disposition remains unchanged.

The *Three-striped Weasel* (*V. Hermaphrodita*), a native of Barbary, is in size between the Civet and Zibet.

The *Genets* are—the *Genet* (*V. Genetta*), eighteen inches long, tail from ten to twelve; colour grey with a yellow tinge. Found in the South of France, in Spain, and in northern Africa as far as the Cape of Good Hope; it is said, also, in southern Asia. It is easily tamed, and breeds in confinement. The *Fossan* (*V. Fossa*), same length as the above; a native of Madagascar. The *Filleted Genet* (*V. Fasciata*) comes from Java. The *Delundung* (*V. Gracilis*), concerning which considerable difference of

opinion is held as to the genus to which this animal belongs; Desmarest, Blainville, and Cuvier place it among the Genets, but Horsfield believing that it has a close affinity to the genus *Felis*, forms a special section in that genus, to which he gives the name *Prionodontidæ*. Length of body fifteen inches, tail twelve and a half; colour pale yellowish white; is a native of Java, inhabiting the forests, but of its habits nothing is known. It is called *Delundung* by the natives.

HERPES—the *Ichneumon*. The *Egyptian Ichneumon* (Plate 6) is about eighteen inches in length from the snout to the root of the tail, and the tail about as long again; the hair very rough and wiry, and each ringed alternately with chestnut brown and fawn, which renders the coat a mixture of the two colours. The Ichneumon is frequently known by the name of *Pharaoh's Rat*, but whence this title is derived is not clear. It is said to be a great destroyer of the eggs and young of the Crocodile, but it may be doubted whether its services in this respect are so great as to entitle it to the deification bestowed upon it by the ancient Egyptians, because the number of Ichneumons is very limited in Upper Egypt, where the Crocodiles abound, whilst in Lower Egypt, where there are but few, the Ichneumon is very common. In Egypt it is domesticated, and serves the purpose of a Cat, destroying the vermin by which the houses are infested. It is fond of poultry, and will feign itself dead till the birds come within its reach, when it springs upon them, and, strangling them, generally satisfies itself by sucking their blood. The Ichneumon will also attack Serpents. The story of the Ichneumon creeping down the Crocodile's throat whilst asleep, and devouring its entrails, is now very properly thrown aside as fabulous. The Ichneumon sleeps rolled up like a ball, with its legs sticking out, and is not very easily awakened; it grows rapidly, and is shortlived, more especially in cold climates.

The *Indian Ichneumon* (*H. Mungo*) is celebrated for its contests with the *Cobra di Capello*, one of the most poisonous Snakes known.

The **RYZENA** (Gr. *ρυζενν*, *tó snarl*) is included by Gmelin with the Viverræ, but classed with the order Sarcophaga by Illiger. One species, the *Four-toed Weasel* (*R. Capensis*), called also the *Cape Surikate*, is well known. Its general appearance, and the nature of its fur, resembles that of the Ichneumon, which has in like manner been separated from the Viverræ. It has but four toes, and it stands higher on its legs than others of the Viverræ.

The other species are—the *Grey Ichneumon* (*H. Grisens*), Cape of Good Hope; *Edwards' Ichneumon* (*H. Edwardsii*), East Indies; the *Hohang Shira* (*H. Vansire*), Madagascar; the *Garangan* (*H. Javanicus*), of Java; also the *Red Ichneumon* (*H. Rubes*), and the *Great Ichneumon* (*H. Major*), the body of which is four inches longer than the Egyptian species, and its coat rougher and longer.

This genus comprises a number of animals of which the habits are very different, though they still bear some general resemblance to each other. The similarity in their structure is very great, and particularly in the form of their teeth. With the exception of one species, of which the varieties are almost innumerable, they are wild and blood-thirsty animals.

CANIS—*Dog*. The genus may be divided into two subgenera, those which have the tail not so long as the body and not furnished with hairs in great numbers—these the *Dogs*; and secondly, those which have the tail very long and covered thickly with hairs, forming a kind of brush, such as the *Foxes*.

First Section—Dogs. Our engraving (Plate 7) gives a representation of the species *C. Familiaris*, the *Domestic Dog*, called also the *Faithful Dog*. His tail bends to the left; snout sharp, nose rounded and rather prominent; body covered with hair; tail of irregular length in the different varieties.

This animal is born with his eyes closed, and they do not become open till the tenth or twelfth day after birth. The female, which is called Bitch, goes with young about sixty days, and pups six or eight young ones: the animal arrives at its full growth in two years, and lives from fifteen to twenty years; the latter of which period it rarely exceeds.

Buffon considers all the varieties to have degenerated from the *C. Domesticus*, affected by climate and other circumstances: six principal varieties

are named. 1. The *Shepherd's Dog* (C. Domesticus), eminently useful in directing the course of Sheep, and in preventing them from straying. These animals are frequently the sole guardians of large flocks in the grazing parts of this kingdom. The same animal, slightly varied by climate, is employed by the Greenlanders to draw their sledges during the long winters. The number of Dogs usually employed for this purpose is five, yoked in couples with a leader; the reins are fastened to the collar, and in driving the cry *tagtag, tagtag*, turns them to the right, whilst *hougha, hougha*, directs them to the left; *ah, ah*, stops them, an *ha* makes them set off. The driver carries a stick ornamented with iron rings, the jingling of which encourages the Dogs, and when they are inattentive to their duty he throws it at them, and catches it up as he passes by. The dexterity of the driver in regaining the stick is a matter of considerable importance, for as soon as the Dogs find that it is lost, they not unfrequently set off at full speed, and rarely stop till the carriage is dashed to pieces, or themselves completely exhausted. The extent of ground over which they will run is almost incredible; they have been known in three days and a half to make a journey of 270 miles.

2. The *Hound* (C. Venaticus). This species includes three kinds of British Dogs: 1. The *Terrier* (C. Terrarius), employed in ousting Foxes from their cover. A remarkable instance of the ability of the Terrier in destroying Rats was formerly exhibited in a cockpit at Westminster, in which a Terrier, named Billy, destroyed a hundred Rats in less than six minutes. 2. The *Harrier* (C. Leverarius), which derives its name from being employed in hunting the Hare. To this division belong the *Foxhound*, which appears to be only a larger kind, and the *Beagle* a smaller kind of Dog. 3. The *Bloodhound*, the *Sleuthounde* of the Scots (C. Sanguinarius), a large, strong, muscular, broad-breasted, stern-countenanced animal, of a deep tan colour, and generally marked with a black spot above each eye; its scent is remarkably keen, and on this account it was formerly much employed in finding out stolen game, and more particularly on the borders of England and Scotland, in tracking those persons who might be obnoxious to their neighbours from their predatory conduct. They are nearly extinct in England at present. Besides the above, the *Dalmatian Dog*, the *Turnspit*, and the *Water Dog*, belong to the same species.

3. The *Spaniel* (C. Aviarius). This species includes Pointers, Setters, King Charles's Dogs, and the Shock Dog. The *Pointer* is employed for the purpose of finding game in shooting. *King Charles's Dog*, a beautiful little animal, derives its name from having been the companion of Charles II., who rarely walked out without being accompanied by several of these little Spaniels. The *Shock Dog* is the Dog which was formerly used as a lap Dog by the ladies.

4. The *Irish Greyhound* (C. Graius Hibernicus), an animal now very rare. It was formerly employed in hunting Wolves, but is not now fit for any sporting purpose in this country. The *Greyhound* and the *Mastiff*, Buffon believes to be degenerate species of the Irish Greyhound.

5. The *Bull Dog* (C. Molossus). This animal is perhaps one of the fiercest and of the greatest courage in the creation; it does not stand very high, but is very strong and muscular. Its courage in seizing the Bull, which it always endeavours to do, by darting at his muzzle, or *pinning* him, as it is technically called, is well known. It is not so common in England now as it was formerly, when the inhuman and brutalizing sport of Bull-baiting was in popular favour. From the Bull Dog is descended the *Pug Dog* and the *Egyptian Naked Dog*.

6. The *Newfoundland Dog* (C. Terræ Novæ), which is known by its height, standing between two and three feet from the ground; his hair long and silky, and his tail covered with long hair, and generally curled over his back; his coat black and white; but the most remarkable circumstance about him is, that the spaces between his toes are completely webbed so as to render him an excellent swimmer. These dogs are very tractable, are easily taught, and are very sagacious. In the island of Newfoundland and in Canada, these Dogs are employed for draught, being harnessed to sledges or small carts, and frequently perform their task without a driver: as soon as they have delivered their load, they return home, and are rewarded with some dried fish, of which they are very fond.

Under the same head the different species of the Wolf tribe are classed.

The *Wolf* (C. Lupus)—Plate 7—is somewhat taller than a large Greyhound; head long; nose pointed; ears erect and sharp; tail straight and shaggy; its tip black; legs long, and the fore legs marked with a black stripe; hair longish, of a greyish-yellow colour, and in the northern parts of the globe becoming whitish during the winter. It inhabits the continents of Europe, Asia, and America, and was formerly very common in England and Ireland, but is now completely extirpated, the last having been killed in Ireland in 1710. This is a cruel, cowardly animal, except when pressed by hunger, when it will attack even men. They are exceedingly inimical to Dogs, and bite very hard. When hunted, it is usual to protect the Dogs' necks with collars armed with iron spikes. There is a species of Wolf Fox at the Falkland Islands, whose tameness and curiosity is recorded by Byron, and corroborated by Mr. Darwin (Journal, p. 193): "they have been observed," he says, "to enter a tent and actually pull some meat from beneath the head of a sleeping seaman. The Gauchos also have frequently in the evening killed them, by holding out a piece of meat in one hand, and in the other a knife ready to stick them."

The *Jackal* (C. Aureus) is very similar in shape to the Wolf, but not so large. It inhabits the warm parts of Asia and Africa, hunts in packs in full cry, from night to morning, and carries off sheep and poultry. Its bark is a kind of howl. When taken young it is easily tamed, and even when wild it readily associates with Dogs. It is vulgarly called the *Lion's Provider*, but all the use it seems to be to the Lion is that of disturbing the more timid inhabitants of the forest, whilst he being on the watch seizes such as he may choose.

The second division embraces the varieties of the *Fox* tribe. (Pl. 7.)

The *Fox* (C. Vulpes) is found in almost every part of the world; and is well known as a most mischievous animal. It has a sharp nose, broad head, lively eyes, body long, of a yellowish-red colour, but subject to great variety on that point; tail straight, nearly as long as the body, and very bushy, tipped with white. In England there are three varieties, the *Greyhound*, the *Mastiff*, and the *Cur Fox*; these differ but little, except in size and some trifling variety of colour.

The other varieties are—the *Cross Fox*, Northern; the *Brant Fox*, from Pennsylvania; the *Karagan*, from Tartary; the *Corsac Fox*, from the Crimea; the *Fulvous-necked Fox*, North America; the *Black Fox*, Siberia; and the *Cape Fox*, Cape of Good Hope.

The Fox is very destructive to poultry and game; it is also very fond of grapes, and does an immense deal of mischief in those countries where there are vineyards.

The last we shall notice is the *Fennek*, of Bruce (Plate 7), the C. Zerda of Pennant. It is a small species, with woolly hair extending beneath the toes; it belongs perhaps to this genus, but it is impossible to give it any proper place, as but little is known about it.

HYÆNA. The *Hyænas* have a general resemblance to the Dog, but are easily distinguished by the greater length of their fore legs, and the hog-like mane which extends more or less along the back; they are morose and vicious in their appearance, voracious, but very cowardly. They pass the greater part of the day in holes, which they dig for themselves, or in clefts or caverns of rocks, from which they sally out in search of prey; and if they cannot find any living animal, will satiate themselves on a dead carcase, however putrid, devouring it bones and all; and should this carrion fail, will tear up graves in order to satiate their ravenous appetite. Their gait is awkward, and when they are first disturbed they limp much in running, but after a short distance they gallop off very swiftly.

Plate 8 contains a figure of the *Striped Hyæna* (H. Vulgaris), an animal about the size of a large Dog, and very strongly made. It has a peculiar cry, said to resemble in its commencement the moaning of the human voice, and ending like a person endeavouring to vomit. This animal is a native of the Caucasian and Altaic chain of mountains, Asiatic Turkey, Syria, Persia, Barbary, Senegal, and the Cape of Good Hope, but here they are not very numerous. The Arabs, when they kill the Hyæna, bury the head to prevent it from being used for magical purposes.

The most common species at the Cape of Good Hope is the *Tiger-Wolf* (*H. Capensis*), a very powerful animal. Although its presence requires caution on the part of the shepherds in regard to their cattle, yet it is a very valuable animal scavenger. It is well known that formerly it came nightly to Cape Town and cleared away the offal, bones, &c., which were thrown out in large quantities.

The *Hairy Hyæna* (*H. Villosa*) is less than the last species, and less powerful; confining its depredations to the destruction of smaller cattle, as Sheep, Goats, &c.; but it does not appear less carnivorous.

FELIS—Cat. The animals composing this genus are provided with the most powerfully offensive organs of the whole family; they are purely carnivorous, of which property the cutting form of their molar teeth, entirely covered with enamel, very thin and sharp, is a strong indication: in a state of nature they prey upon living animals, which, having a bad scent, they do not hunt, but lurk about and seize by surprise, approaching under cover very cautiously, and suddenly springing upon them when within reach. A



Teeth of Carnivorous Animal.

remarkable circumstance is observable in their retractile claws, which in walking are raised upwards by means of elastic ligaments, so that they never touch the ground, but are kept sharp, to enable them more easily to hold and tear their prey to pieces. In temper generally cruel, wary, and untamable, few of them are capable of domestication or attachment to man; they are cowardly, and if they fail in their attack, often slink away without a second attempt to capture their prey. The larger species are natives of hot climates, but the others are found in the more temperate and even icy regions.

1. Cats of large size, yellow and unspotted:—

The *Lion* (*F. Leo*), which stands about four feet and a half high; his length from the snout to the root of the tail is from seven to eight feet, and the tail itself four more; the head is larger and of a squarer form than in the other species of this genus. The body and limbs are strong and muscular; the back, flanks, hind quarters, tail, and fore legs, covered with close, short, tawny hairs tipped with black, and intermixed with a few entirely black; the whole chest, shoulders, neck, and front of the head, clothed in long, shaggy hair, black and tawny intermixed; that on the head and neck longer than the other, and forming the mane, which is capable of erection; ears small and rounded; tip of the tail tufted with long dark-coloured hair. The *Lioness* is about a fourth less than the *Lion*, from which she further differs in not having a mane; she goes with young five months, and whelps three or four at a time, of which she is extremely careful. The young animals when first whelped are covered with rough, woolly hair, of a tawny colour, mingled with black and grey. After each casting the coat, the animal gradually approaches the colour of the adult; but the young *Lion* has no mane; it does not begin to appear till the animal reaches the age of three, nor is it complete before five years. The whelps remain at the teat about twelve months. The *Lion* in the wild state is found extremely fierce and courageous, when his habitation is in the arid and desert plains of the interior of Africa; but in proportion as his haunts more nearly approach the dwellings of man, his courage becomes subdued, and he has recourse in seizing his prey to that cunning which so remarkably characterises the genus, instead of attacking it with boldness as when living in his native woods. The strength of the *Lion* is very great; a stroke of his paw is said to be sufficient to break the back of a Horse. He is capable of bearing away very large animals, and has been known to leap over a broad ditch, having a heifer in his mouth.

We have purposely condensed our remarks upon the *Lion* in order to introduce a few extracts from a work recently published, entitled "Five Years of a Hunter's Life in South Africa." The author, Mr. Gordon Cumming, must certainly be ranked as one of the most daring and successful of the disciples of Nimrod; and his journal, we have no doubt, will afford to thousands throughout the kingdom much amusement during the winter's nights of 1850-1.

The *Lion's* roar is thus described by Mr. Cumming: "The night of the 19th March, 1844, was to me rather a memorable one, as being the first on which I had the satisfaction of hearing the deep-toned thunder of the *Lion's* roar. Although there was no one near, to inform me by what beast the haughty and impressive sounds which echoed through the wilderness were produced, I had little difficulty in divining. There was no mistake about it; and on hearing it I at once knew, as well as if accustomed to the sound from my infancy, that the appalling roar which was uttered within half a mile of me was no other than that of the mighty and terrible king of beasts. . . . At times, and not unfrequently, a troop may be heard roaring in concert, one assuming the lead, and two, three, or four more regularly taking up their parts, like persons singing a catch. Like our Scottish stags at the rutting season, they roar loudest in cold, frosty nights; but on no occasions are their voices to be heard in such perfection, or so intensely powerful, as when two or three strange troops of *Lions* approach a fountain to drink at the same time. When this occurs, every member of each troop sounds a bold roar of defiance at the opposite parties; and when one roars, all roar together, and each seems to vie with his comrades in the intensity and power of his voice. The power and grandeur of these nocturnal forest concerts is inconceivably striking and pleasing to the hunter's ear. The effect, I may remark, is greatly enhanced when the hearer happens to be situated in the depths of the forest, at the dead hour of midnight, unaccompanied by any attendant, and ensconced within twenty yards of the fountain which the surrounding troops of *lions* are approaching. Such has been my situation many scores of times; and though I am allowed to have a tolerably good taste for music, I consider the catches with which I was then regaled as the sweetest and most natural I ever heard."

Mr. Cumming goes on to describe the power and habits of this noble animal:—"The *Lion* is exquisitely formed by nature for the predatory habits which he is destined to pursue. Combining in comparatively small compass the qualities of power and agility, he is enabled, by means of the tremendous machinery with which nature has gifted him, easily to overcome and destroy almost every beast of the forest, however superior to him in weight and stature. . . . *Lions* do not refuse, as has been asserted, to feast upon the venison that they have not killed themselves. I have repeatedly discovered lions of all ages which had taken possession of, and were feasting upon, the carcasses of various game quadrupeds which had fallen before my rifle. The *Lion* is very generally diffused throughout the secluded parts of Southern Africa. He is, however, nowhere met with in great abundance, it being very rare to find more than three, or even two, families of *Lions* frequenting the same district and drinking at the same fountain."

Our author's encounter with a *Lion* and *Lioness* is full of interest:—"It was a cold, windy morning, and I lay in my waggon longer than usual. My other Hottentots thought proper to leave their charge, and go in quest of honey under the guidance of a garrulous honey-bird. I had lain about twenty minutes in my waggon after they had all started, and was occupied in reading a book, when suddenly I heard the oxen come trotting along in front of the waggons, as if sharply driven. On raising my head from my pillow I perceived a *Lioness* following within twenty yards of them, and next moment her mate, a venerable-looking *Lion*, with a shaggy mane which swept the ground, appeared in the yellow grass in front of the oxen, waiting for her to put them to flight. The plot had evidently been preconceived between them, this being the usual manner in which the *Lion* attacks the *Buffaloes*. Fortunately the oxen would not run for them, and the *Lions* seemed surprised at the confidence of their game. On springing to my feet and shouting to them, they joined one another, and stood together beneath a shady tree within a hundred and twenty yards of the waggons. My horses were pasturing at a short distance from the *Lions*, feeding towards me, and on these they seemed now to meditate an attack, their attention being divided between the horses and myself. In such a position of affairs I considered it high time to give these bold intruders a hint whose cattle they were so carefully herding. Snatching up my two-grooved rifle, which at all times hung loaded in my waggon, I at once ran forward under cover of a convenient bushy tree which intervened, and on gaining this bush I was

within seventy yards of the Lions. Here a forked branch afforded an admirable rest. I placed my rifle in the fork, and, taking the old Lion low, I let fly, hitting him in the shoulder; the two then wheeled about, and, bounding forward with angry growls, disappeared among the trees.

"From the cool state I was in when I fired, and the steady aim which the forked branch had afforded me, I felt convinced that the Lion, if not dead, must be mortally wounded, but I prudently resolved not to proceed in quest of him alone. Presently some of my men, who had gone to the carcass of a buffalo I had slain the previous day, returned bringing the dogs; and, having informed them of what had happened, I proceeded to take up the spoor of the wounded Lion. On reaching the spot where the Lions had stood, my dogs at once commenced barking angrily and looking sharply around in every direction, their hair bristling on their backs. I at once discovered blood, which increased as I proceeded from small red drops to large frothy blotches; and before advancing two hundred yards, on approaching a dense green bush, my dogs, which led the way, sprang suddenly to one side, barking with great vehemence. By this I knew that the Lion was dead, and, on cautiously rounding the bush, taking care at the same time to give it a wide berth, I had the satisfaction to behold a princely Lion stretched lifeless on the ground. He was in the prime of life, having fine sharp teeth; and it being now the dead of winter he carried the most luxuriant coat of hair, the rankness of his flowing mane exceeding in beauty anything I had hitherto seen. I considered myself extremely fortunate in having secured so noble a specimen of the Lion with so little danger, and I at once set men to work to unrobe him, which they were not long in accomplishing."

Not less interesting is his recoutre with a troop of Lions and Hyænas:—"On reaching the water I looked towards the carcass of the rhinoceros, and, to my astonishment, I beheld the ground alive with large creatures, as though a troop of zebras were approaching the fountain to drink. Kleinboy remarked to me that a troop of zebras were standing on the height. I answered, 'Yes,' but I knew very well that zebras would not be capering around the carcass of a rhinoceros. I quickly arranged my blankets, pillow, and guns in the hole, and then lay down to feast my eyes on the interesting sight before me. It was bright moonlight, as clear as I need wish, and within one night of being full moon. There were six large Lions, about twelve or fifteen hyænas, and from twenty to thirty jackals, feasting on and around the carcasses of the three rhinoceroses. The Lions feasted peacefully, but the hyænas and jackals fought over every mouthful, and chased one another round and round the carcasses, growling, laughing, screeching, chattering, and howling without any intermission. The hyænas did not seem afraid of the Lions, although they always gave way before them; for I observed that they followed them in the most disrespectful manner, and stood laughing, one or two on either side, when any lions came after their comrades to examine pieces of skin or bones which they were dragging away. I had lain watching this banquet for about three hours, in the strong hope that, when the Lions had feasted, they would come and drink. Two black and two white rhinoceroses had made their appearance, but, scared by the smell of the blood, they had made off.

"At length the Lions seemed satisfied. They all walked about with their heads up, and seemed to be thinking about the water; and in two minutes one of them turned his face towards me, and came on; he was immediately followed by a second Lion, and in half a minute by the remaining four. It was a decided and general move, they were all coming to drink right bang in my face, within fifteen yards of me.

"I charged the unfortunate, pale, and panting Kleinboy to convert himself into a stone, and knowing, from old spoor, exactly where they would drink, I cocked my left barrel, and placed myself and gun in position. The six Lions came steadily on along the stony ridge, until within sixty yards of me, when they halted for a minute to reconnoitre. One of them stretched out his massive arms on the rock and lay down; the others then came on, and he rose and brought up the rear. They walked, as I had anticipated, to the old drinking-place, and three of them had put down their heads and were lapping the water loudly, when Kleinboy thought it necessary to shove

up his ugly head. I turned my head slowly to rebuke him, and again turning to the Lions I found myself discovered.

"An old Lioness, who seemed to take the lead, had detected me, and, with her head high and her eyes fixed full upon me, she was coming slowly round the corner of the little vley to cultivate further my acquaintance. This unfortunate proceeding put a stop at once to all further contemplation. I thought, in my haste, that it was perhaps most prudent to shoot this Lioness, especially as none of the others had noticed me. I accordingly moved my arm and covered her: she saw me move and halted, exposing a full broadside. I fired: the ball entered one shoulder and passed out behind the other. She bounded forward with repeated growls, and was followed by her five comrades all enveloped in a cloud of dust; nor did they stop until they had reached the cover behind me, except one old gentleman, who halted and looked back for a few seconds, when I fired, but the ball went high. I listened anxiously for some sound to denote the approaching end of the Lioness; nor listened in vain. I heard her growling and stationary, as if dying. In one minute her comrades crossed the vley a little below me, and made towards the rhinoceros. I then slipped Wolf and Boxer on her scent, and, following them into the cover, I found her lying dead within twenty yards of where the old Lion had lain two nights before. This was a fine old Lioness, with perfect teeth, and was certainly a noble prize; but I felt dissatisfied at not having rather shot a Lion, which I had most certainly done if my Hottentot had not destroyed my contemplation."

The following account of a dangerous interview with a Lioness must close our present reference to Mr. Cumming's volumes, brimful though they are with wonderful exploits and hairbreadth escapes:—"Having proceeded about half-way, I suddenly observed two huge yellow Lionesses, about a hundred and fifty yards to my left, walking along the edge of the reeds, holding a course parallel to my own. The reitbucks smelt the Lions and lay down. I got very near them, but they started off, and bounded straight away from me: I fired and missed the buck.

"Ruyter came towards me, and I ran forward to obtain a view beyond a slight rise in the ground to see whither the Lionesses had gone. In so doing I came suddenly upon them, within about seventy yards; they were standing looking back at Ruyter. I then very rashly commenced making a rapid stalk in upon them, and fired at the nearest, having only one shot in my rifle. The ball told loudly, and the Lioness at which I had fired wheeled right round, and came on lashing her tail, showing her teeth, and making that horrid murderous deep growl which an angry Lion generally utters. At the same moment her comrade, who seemed better to know that she was in the presence of man, made a hasty retreat into the reeds. The instant the Lioness came on I stood up to my full height, holding my rifle, and my arms extended, and high above my head. This checked her in her course, but on looking round and missing her comrade, and observing Ruyter slowly advancing, she was still more exasperated, and, fancying that she was being surrounded, she made another forward movement, growling terribly. This was a moment of great danger. I felt that my only chance of safety was extreme steadiness, so, standing motionless as a rock, with my eyes firmly fixed upon her, I called out in a clear commanding voice, 'Holloa! old girl, what's the hurry? take it easy; holloa! holloa!' She instantly once more halted, and seemed perplexed, looking round for her comrade. I then thought it prudent to beat a retreat, which I very slowly did, talking to the Lioness all the time. She seemed undecided as to her future movements, and was gazing after me and snuffing the ground when I last beheld her."

Lions are found throughout Africa, in those parts of Arabia and Persia which border on the Tigris and Euphrates from the Persian Gulf as far as Bagdad. They vary from each other in some trifling particulars.

The *Barbary Lion* is that which has been already described.

The *Senegal Lion* has a brighter and yellower coat than that from Barbary, but its mane is neither so thick nor long.

The *Arabian Lion* is smaller than the others; the males are much larger than the females, and have no mane.

The *Conguar*, called also the *Puma* (F. *Concolor* et *Discolor*), differs

from the Lion in the smallness of the head and want of mane, and tufted tail; it measures about five feet in length, and the tail is two feet long and trailing; its limbs are strong but short, and therefore it stands low. It is a native of America, both of the South and North. The Indians employ its coat, which is soft, for clothing, and from it also are made gloves and shoes. It is sometimes called the Poltron Tiger.

2. Cats of large size, and striped transversely with black:—In this division we find the *Royal Tiger* (F. Tigris), which in size nearly resembles the Lion, but the body is more slim, and the head rounder and smaller: it stands about three feet in height.

The Tiger is found only in Asia, extending as high as Chinese Tartary, but is more common in India, and lives in ravines and jungles. Cowardly, cunning, and cruel, it is a dreadful scourge to the countries which it inhabits, as it does not hesitate to attack almost every kind of animal, not excepting man: for these it lurks in ambush among the thick cover, and with a dreadful roar, springing upon it with a bound from an almost incredible distance, quickly drags it into its retreat, from which there is no chance of recovery; should he however fail in his aim, he slinks off till a more fitting opportunity. Like the Lion, the Tiger if taken young will occasionally become very docile. Tiger skins are considered of great value throughout the East, and especially in China, where they are used to cover the seats of justice for the mandarins.

The *Rimau Dahan* (F. Macroleis), a native of Bencoolen, seems to connect the Tiger with the Leopard, possessing the strong legs and thighs of the former, with the more cylindrical form of the body belonging to the latter.

3. Cats of large size, marked with round dark spots:—The *Jaguar*, or *American Tiger* (F. Onca), the Great Panther of the furriers, is nearly as large as the Tiger, but of heavier proportions. It is found in various parts of South America, passing the day in caves amongst the marshy forests, but at night it sallies forth in quest of prey, and will attack Oxen and Horses, the latter of which it is said to carry off as a Wolf does a Sheep: it does not fear Dogs, and will even attack men in the desert.

The *Panther* (F. Pardus), about four feet in length, and the tail when reflected reaches the tip of the nose; the general colour deep fulvous yellow on the upper part and sides of the body, and ashy beneath.



Panther.

The *Cape Cat* (F. Serval), not quite so large as the Panther, is a native of the Cape of Good Hope, where it is called *Tyger-bosch kat*, and of all the southern parts of Africa.

The *Leopard* (F. Leopardus) is rather smaller than the Lioness; its tail as long as the body, and when reflected extending only to the shoulders; general colour yellow above and white beneath. Native of Southern Africa.

The *Hunting Leopard* (F. Jubata) is somewhat less than the Panther, and is very remarkable in having the claws non-retractile, by which circumstance it connects this genus with Dogs. This animal is found in India, where it is trained to hunt Antelopes.

4. Cats of moderate size, spotted with yellow, edged with black:—The

Brazilian Tiger (F. Mitis), more than two-thirds the length of the Hunting Leopard. It is a native of Paraguay, where it is common, and known as the *Chibigouazou*; it lives in the forests, but steals out at night to attack the domestic animals: when taken it becomes familiar and docile; its voice resembles that of the Cat, but is deeper toned.

The *Ocelot* (F. Pardalis), a native of Mexico, much resembles the habits of the other species, and climbs trees.

The *Oceloid Cat* (F. Macroura) very nearly resembles the Ocelot: it is three feet eight inches in length; tail nineteen inches.

5. Cats of moderate size, standing high on the legs; ears large, and not unfrequently tipped with a tuft of long hairs; tail rather short:—The *Lynx*, measuring rather more than two feet from the nose to the tail; tail seven inches; skin very soft. It is a native of the forests of central Europe, but never found in India; it was formerly found in France, and but lately has disappeared in Germany.

The *Muscovite Lynx* (F. Cervaria), about the size of a Wolf; its fur is very long and thick. The skins of this species are highly valued, and adult skins with very black spots will fetch 100 to 120 or 130 francs.

The *Canadian* or *Swedish Lynx* (F. Borealis), in size between the Wolf and the Fox; the *Bay Lynx* (F. Rufa), a native of America, is smaller than the common Lynx; the *Caspian Lynx* (F. Chaus), about two feet long, and its general figure is that of a Cat; the *Booted Lynx* (F. Caligata), about the size of a Cat, a native of Lybia and Barbary; the *Persian Lynx* (F. Caracal) measures about two feet and a half long, and sixteen inches high, a native of Persia, India, and Barbary; the *Portuguese Lynx* (F. Pardina), the Lynx of the furriers, is in size equalling the European Badger, but standing high on the legs; tail short, but longer in proportion to its size than that of the European Lynx; the skin is not very valuable.

Besides the above there are—the *Fasciated Lynx*, the *Mountain Cat*, the *Florida Lynx*, and the *Golden Lynx*, all natives of America.

6. Cats of moderate or small size and short legs—CATS properly so called:—The *Common Cat* (F. Catus) measures about two feet eight inches, and some large males three feet, of which one foot is the length of the tail; it varies much in size, according to the countries it inhabits; those of the south are not larger than our Domestic Cat, whilst those of Asia and the midland forests of Europe are much larger. The fur is soft, very long; the silky hairs few, but also very long. The Wild Cat is found in all the large forests of Europe; those of Hungary and Russia, and the Asiatic provinces, are of a larger kind, their fur much finer, and more valuable.

The *Booted Cat of Egypt* (F. Maniculata) resembles in form the last species, except in being a third less in size, and having the tail longer and more slender; the fur is short and silky, but the woolly hair sparing.

Much difference of opinion has existed among zoologists as to the stock whence our Domestic Cat proceeds. It was formerly supposed to have sprung from the *Wild Cat* (F. Catus); and Schreber has very properly distinguished it from that animal by its smaller size, and the comparative shortness and thickness of its hair.

The value of Cats seems in time past to have been well understood; for during the reign of Howel Dda or Hoel the Good, a Prince of Wales, who died A.D. 948, laws were in existence for its preservation; any person who destroyed a Cat belonging to the Prince's granary was to be fined one milch ewe, her fleece and lamb, or as much wheat as would cover the tip of the Cat's tail when she had been hung up by the tail with her head touching the ground. The intrinsic value of the animal depended on its age: a kitten before it could see was prized at a penny; till it had caught a Mouse twopence, and after that time fourpence, which at that period were large sums; the seller forfeited a third of its value, however, if the Cat had not its claws whole, was not a good mouser, and, if a female, not a good nurse.

There are several varieties of the Domestic Cat: the *Chartreux Cat*; the *Spanish Cat*, or *Tortoiseshell Cat*, as it is commonly called; and the *Angora Cat*, remarkable for the great length and silkiness of its hair.

We merely name the other species: the *Peruvian Cat* (F. Celidogaster), the *Eyra Cat*, and the *Jaguarondi*, natives of Paraguay; the *Pampa Cat* (F. Pajeros), and the *Cayenne Cat* (F. Tigrina), natives of South America;

the *Bengal Cat* (F. *Javanensis*), native of Java; and the *Manul*, from Mongolian Tartary.

MEGALOTIS—the *Fennec*. Of the *Fennec* there is but one known species (M. *Brucii*), and this has been formed into a distinct genus by Illiger. From the examination of one of the specimens now in the Zoological Museum, Mr. Yarrell is convinced that it is a true *Canis*.

PARADOXURUS. This genus resembles the *Civets* in the form of its teeth, but is distinguished from them by its more close-set form and by the peculiar arrangement of the tail, which, when rolled up only partially, the extremity exhibits the appearance of the prehensile tail of some American Monkeys, but if the curling be continued, the whole tail down to the root curls in a spiral form. The soles of the feet are tubercular, and the animal treads on nearly the whole length of the foot, and has therefore some analogy to the *Raccoons*.

The species *Musang* (P. *Typus*) is twenty inches in length; tail twenty-two inches. In Java it is very destructive among the coffee plantations, where it is called the *Coffee Rat*; but its ravages are compensated by its propagating the coffee plant in various parts of the forests and especially on the declivities of fertile hills, thereby affording to the natives of the western districts of Java no inconsiderable harvest without trouble on their part. Schinz and Fisher include the *Delundung* or *Felis Gracilis* of Horsfield in this genus, but Cuvier places it among the *Genettes*.

PROTELES. The name applied to this genus refers to its being furnished with five anterior toes instead of four like the *Hyæna*, in which the thumb is entirely deficient or at least only rudimental; and though it in this respect resembles the *Civets*, it differs from them in the proportional form of the fore limbs, in which it corresponds with the *Hyænas*. It is remarkably characterised by the shortness of its hind limbs, giving to the animal its peculiar gait, which has necessarily great influence on its habits. They are nocturnal, and are very dexterous in burrowing like the *Fox*, always, however, taking care to have numerous entrances to their hole. When angry, they bristle up their fur over the whole body. They run pretty quickly. They are found in the interior of Caffraria, and are so rare that they do not appear to be known to the natives.

Family—FIN-FOOTED; Pinnata.

This family is characterised by feet so extremely short that on land they barely assist the animal to crawl with, but in the water they serve as fins: this circumstance, combined with their general conformation, renders them expert swimmers. They come on land to suckle their young, or to enjoy the glowing rays of the sun. They are known as Amphibious Animals. The term Pinnata is from the Latin *pinna*, “a wing of a bird,” or “a fin of a fish.”

ILLUSTRATIVE EXAMPLES.

PLATE 9.

Genera.	Species.	Common Name.
Phoca - - - -	Vitulina - - - -	Common Seal.
Otaria - - - -	Nigra - - - -	Black Otary or Seal.
Trichechus - - - -	Vosmarinus - - - -	Walrus.

CHARACTERS OF THE GENERA.

- 1. PHOCA (Gr. *φωκῆ*, a sea-calf). Four or six incisive teeth in the upper, and two or four in the lower jaw, all pointed; cuspid teeth conical and slightly curved; molar teeth twenty-two or twenty-four, triangular, and cutting or pointed; muzzle and lips large; nostrils capable of being perfectly closed, in one species extensible into a kind of trunk; whiskers large and numerous; external ears deficient; body covered with short, coarse hair, lengthy, and tapering towards the tail, which is short; legs hardly projecting from the trunk; the feet five-toed, and the toes included in membrane forming fins, with their pointed nails at the edge.
- 2. OTARIA (Gr. *ὄτρε*, *ὠτόν*, an ear). Distinct though small auricles or external ears; incisive teeth, above, six, of which the middle four have a double cutting edge, whilst the outer are single and smaller, below, four, forked,

molar simply conical; membrane of the hind feet expanded into a kind of lobe reaching beyond each toe; nails flat and slender.

3. TRICHECHUS (Gr. *τριχ*, hair, and *ἔχω*, I have). Muzzle obtuse, and upper lip cleft; in the upper jaw four incisive teeth, the middle two very small and deciduous, the outer larger, cylindrical and obliquely truncated inwards; cuspid teeth large, projecting downwards, cylindrical, pointed, slightly curved, and their inner edge grooved longitudinally; in the lower jaw, neither incisive nor cuspid teeth; molar, ten in the upper and eight in the lower jaw, short, cylindrical, truncated; no auricles; body lengthy, fat, and tapering towards the tail, which is little more than a fold of skin; feet five-toed, the toes connected with membrane, and forming paddles or fins; on the fore feet the inner toe or thumb is the longest, on the hind, the inner and outer are much longer than the intermediate ones, and both hind paddles are directed backwards, and approximated; claws short; four ventral teats.

PINNATA.—DESCRIPTION OF THE SPECIES.

PHOCA—Seal. Seals differ but little from the Otaries; the principal difference being in the absence of the auricle, and in the shortness of the membrane of their fins. Their habits are very similar, living together in large herds, principally passing their time in the seas, and only coming ashore for any continuance during the time occupied by whelping and bringing up their young. For this purpose they migrate in large herds from the frozen Polar regions to warmer, desert shores, and having there effected their object, return again to the colder climes for which they are especially adapted, being covered with a large quantity of fat, which, as with the Whales, protects their animal heat from being destroyed by the extreme cold to which they are continually subjected. They feed almost entirely on fish, which they take by diving; and in order to facilitate their operations, the front of the eye is flattened somewhat like that of fishes, which enables them to see better beneath the water than indeed they can above it. They possess also, by a peculiar contrivance, the power of closing their nostrils so as to prevent the entrance of the water; and their external auditory passage is of such form as to preclude its admission there. They are generally harmless and inoffensive, except when provoked, and are then much more dangerous at sea than ashore, as when in the water their motions are active, but on land the bulkiness of their bodies and the form of their limbs, adapted to little more than swimming, prevent them from moving quickly.



Seal.

They have been divided into the following subgenera:—1. The *Calcephala*, large skull and short muzzle. The *Common Seal* (P. *Vitulina*). From five to six feet in length. The appearance of the skin varies according as it is wet or dry: when the Seal first leaves the water, the head, the upper part of the body, the hind limbs, and the tail are slaty-grey, but on the sides is varied with little round spots on a paler and yellowish ground, of which tint are the under parts. When dry, the grey marking is seen only along the mesial line, and sometimes there are also irregular spots on the body of the same colour, but generally the rest of the body is entirely yellowish. They are found in most parts of the world. They feed on all kinds of fish, and are themselves very good food. If taken young, they are easily tamed, will answer to their names when called, and appear as much gratified with their master's caresses as a Dog. To the Greenlanders, Seals are, as it has been well said by Crantz, “more needful than Sheep to us”—the flesh supplying them with food; their fat with oil both for cooking and for light; of the tendons they make thread; of the skins of the entrails they make windows, tent-curtains, and shirts, and train-oil bottles of the maw; with the skins they cover their boats and tents, and formerly, when they could not procure iron, they converted the bones into all kinds of instru-

ments and working tools. The Greenlander catches Seals either accompanied by other fishers, which occupation is then called a *Clapper-hunt*, by shooting them, or by other contrivances. The *Clapper-hunt* consists in a party going out together in their *kajaks*, or boats, and cutting off the Seals' retreat; they then frighten them under water by ballooning and pelting them with stones, and as the Seals are obliged to come up for air this is repeated till they are tired, when the hunters destroy them with the *agligak*, an instrument resembling the *erneinek*, or harpoon dart, but differing from it in having the shaft only a foot and a half long. If the Seal has a good broad water of three or four leagues in extent, it will keep the sportsmen occupied for a couple of hours before they can approach near enough to kill it, as in the early part of the chase it will often start up three-quarters of a mile distant from the spot at which it had dived. But if it approach the land in order to escape, it is driven off by the women and boys, and soon destroyed by the men who are in its rear. (Plate 9.)

The *Leporine Seal*, the *Harp Seal*, the *Rock Seal*, the *White-clawed Seal*, the *Rough Seal*, and the *Great Seal*, inhabitants of the White Sea, coast of Iceland, and within the Polar circle from Spitzbergen to Tehutki Noss. The *Hare-tailed Seal*, from Terra Neuve, and the *Griffin Seal*, Baltic Sea; the *White-tailed Seal*, and the *Marbled Seal*—haunts not known.

2. The *Stenorhyncha*; narrow muzzles. There are two species; the *Small-tailed Seal* (P. Leptonyx). From seven to nine feet in length: comes from the Falkland Islands and from New Georgia. The *Weddell Seal*, common on the shores of the Southern Orcaes.

3. The *Pelagia*; inhabitants of the deep seas. The specific name is *Monk* (P. Monachus), arising from the fact that when placed on its back, the skin wrinkles up like a monk's hood. It is found in the Adriatic Gulf.

4. The *Stennopata*, the *Hood-cap*, so called from having a moveable and inflatable membrane upon the top of the head, the structure of which, however, is not satisfactorily made out. One species, the *Hooded Seal* (P. Cristata), has upon its forehead a thick folded skin, "which," says Crantz, "it can draw over its eyes like a cap, to defend itself against the storms, waves, stones, and sand." It is found in the southern part of Greenland; and, according to Crantz, makes two voyages annually to Davis's Straits.

5. The *Macrorhyncha*, from the large size of its muzzle. The *Proboscis Seal*, which belongs to this subgenus, is the largest of the seals. It measures from twenty to thirty feet in length, and fifteen or eighteen in circumference. The male is distinguished by having the power of projecting the muzzle in form of a proboscis: this, when the animal is at rest, being loose and pendent, gives great breadth to the face, but whenever it breathes strongly, or is about to attack or to defend itself, the muzzle becomes elongated into a tube of a foot long. In the female there is not this formation, and the upper lip is merely slightly cleft at its edge. These animals are natives of the South Seas exclusively, and are particularly attached to desert isles, and more especially to some than to others: thus they are found in great numbers on Hunter's, King's, and New-year's-day Islands, are rare on that of Two Sisters, and are entirely strangers to Mary's Island and the Ile Decres; nor do they exist either on the continent of New Holland, nor on Van Diemen's Land, though occasionally they are driven by tempest on the coasts of the latter two countries. They come northward in the middle of June, and the shores of King's Island are then swarming with them. About a month after their arrival, the females begin to drop their young, surrounded by the males, which will not allow them to return to the sea till they have ceased suckling their young, which increase from seventy pounds to one hundred in the course of eight days, and the dams, as might be expected, become extremely thin. After fifteen days, the teeth begin to appear, and in four months are entirely cut. Their growth is so rapid, that by the third year they have attained from eighteen to twenty-four feet, which is their ordinary length, and after that time they do not grow at all. When six or seven weeks old, their dams conduct them to the sea, and the shores are entirely deserted, and if in swimming about any of the cubs straggle from the herd, they are speedily driven to it again by some of the older Seals. After remaining three weeks or a month at sea

to accustom the young to it, they return to land for the purpose of mating, and this takes place among those which have attained three years, when the proboscis is developed, but not till then. At this time the contests between the males are very severe. The two rivals drag themselves along heavily; they close, and putting muzzle to muzzle, raise the whole fore part of their body on their fins, open their wide mouths, their eyes flaming with anger, and then dashing against each other with all their might, they fall on, tooth to tooth and jaw to jaw; severe wounds are often inflicted, sometimes the eyes are struck out, and frequently the tusks broken; but in spite of these they fight on till completely worn out, whilst the females patiently await the issue of the combat which is to furnish them with a spouse. The Proboscis Seal appears to be naturally of a good temper, allowing the smaller species to swim among them without molestation, and when on shore never attacking man unless provoked, so that people may walk among them without danger.

OTARIA—*Otary*. The animals forming this genus were separated by Peron from the *Phoci*, or *Seals*, in consequence of their being furnished with an external ear, and also from the variation in the form of their teeth. Like the Seals, however, they are aquatic animals, and spend but little time ashore, except during the breeding season. Although living together in herds, each family remains perfectly distinct from other of their companions, and any even accidental intrusion is speedily repelled by violence. Each male is accompanied by many females, sometimes amounting to sixty or seventy in number, but varying in the different species; these they guard with great jealousy, and fierce contests are frequently the result of any attempt at abduction. They live upon fish, mollusca, marine plants, and occasionally prey upon each other. The females produce one or two cubs annually, which they suckle and tend with the greatest care. Generally, they are natives of the Polar regions, but some species are found in the Mediterranean, and others off the Cape of Good Hope. (Plate 9.)

The species are—the *Lion-maned Otary*, the *Ursine Otary*, the *Little Otary*, the *Crowned Otary*, the *Cinereous Otary*, the *White-necked Otary*, the *Yellow Otary*, and the *Falkland Otary*.

TRICHECHUS—the *Walrus*. The general form of the Walrus, of which but a single species is known, corresponds to that of the seals, excepting as to the head and teeth. The alveolar cavities of the upper jaw are large to receive the large tusks, and thus render the muzzle large and full, whilst the nostrils, instead of being placed at its tip, are directed upwards, and the lower jaw is compressed and narrow, so as to be received between the tusks, projecting about two inches beyond the upper. There are but two upper incisive teeth, which greatly resemble molar teeth in shape, and in young animals there is also a still smaller tooth on each side, between these and the cuspid teeth; the tusks are large, and project about two feet from the jaw; they are of the finest ivory; the lower jaw has neither incisive nor cuspid teeth; the molar teeth are four on a side in either jaw, cylindrical, short, and truncated obliquely; in young animals there is sometimes a fifth.

The *Arctic Walrus* (T. Rosmarus) is usually from ten to twelve feet, but occasionally as much as eighteen to twenty feet in length, and from ten to twelve in girth; the eyes are small, fiery, and sunken; ears only minute apertures far back on the head; mouth very small and the lips thick, the latter beset with transverse rows of transparent bristles, as thick as straws, and curving downwards: the neck is very short. The whole animal is enveloped in a thick wrinkled hide, thickest about the neck, and is covered with short hair, mouse-coloured, reddish or grey. The Walrus, or Morse, as it is sometimes called, is gregarious, living occasionally in flocks of thousands. They are very timid, and avoid the haunts of man, living almost entirely upon ice islands, where they sleep, as also indeed even in the water. One great use of their tusks is to enable them to look on to the edge of the ice, and with the aid of their fore-fins to scramble on to its surface. They are monogamous, couple in June, and early in the following spring bring forth one, and rarely two, young ones. They feed on molluscs and also on sea-weed. They are harmless, except provoked, but then, especially if wounded, are very fierce, and will even attack boats, endea-

vouring to get over the gunwale by means of their tusks. They are spread generally throughout the Arctic seas, and are hunted for the sake of their oil, skin, and ivory. (Plate 9.)

ORDER IV.—MARSUPIALA. POUCH-BEARERS.

THE young of these animals are born in a very imperfect state, but nature having provided the parent with a sort of pouch around the abdomen, which answers the office of a second womb, they are deposited therein; here, fastening themselves to the teats of the mother, they remain until their undeveloped organization has arrived at its proper state of perfection.

Family—FLESH-EATERS; *Carnivora*.

ILLUSTRATIVE EXAMPLES.

PLATE 10.

Genus.	Species.	Common Name.
Dasyurus	Maugei	Mauge's Dasyure.

Other Genera of this Family:—Phascologale, Thylacinnus.

CHARACTERS OF THE GENERA.

1. **DASYURUS** (Gr. *δασύς*, hairy, and *οὐρά*, a tail). Eight incisor teeth in the upper, and six in the lower jaw, small and regular; two long canine and twelve molar teeth in each jaw; the two anterior molar thin and cutting, and the four posterior crowned with points; body slender; head conical, snout pointed, and the mouth very wide; eyes small and sharp; anterior extremities having five toes armed with claws, the posterior having but four, which are without claws, and a thumb which is so short as to appear like a tubercle; the tail long, and covered with long hairs, but not prehensile.

2. **PHASCOLOGALE** (Gr. *φασκῶλος*, a pouch, and *γαλήν*, a cat). Incisive teeth in the upper jaw eight, of which the middle two are thick, rounded, pointed, converging at their tip, and longer than the lateral, which are very small, and separated from them by a gap; in the lower jaw eight incisive, of which the middle two, twice as large as those on the sides, are inclined forwards; cuspid teeth of moderate size, those in the lower jaw the smallest; molar teeth seven on a side in each jaw, the first three conical, single-pointed, and grooved on their inner side, the last four nearly triangular, many-pointed, and of unequal size; muzzle naked and cleft; ears large and naked.

3. **THYLACINUS** (Gr. *θυλάκος*, a pouch). Incisive teeth eight in the upper and six in the lower jaw, of equal length, but the outer one on each side largest, regularly disposed in a semicircular form, and separated in the middle by a gap; cuspid teeth large, strong, curved and pointed; molar teeth seven on a side in each jaw, of which the front two are false molars, and the other five very strong and large, irregularly triangular, and furnished on their crowns with blunt tubercles, but the first of them has only two tubercles; of the lower molars, which are compressed and three-pointed, the middle point is the most elevated; the hinder three resemble those of the dog; hind feet thumbless; tail compressed on the sides, and terminating in a point.

CARNIVORA.—DESCRIPTION OF THE SPECIES.

DASYURUS. The animals composing this genus are natives of New Holland. Like the Opossums they live upon flesh and insects, but cannot climb like them, as the strong thumbs of the hind feet and the prehensile tail are wanting.

The species are—the *Dog-headed Dasyure* (*D. Cynocephalus*), about the size of a Dog, three feet and a half in length; the fur of the skin short, of a deep grey on the back, and yellowish brown beneath: the animal is a good swimmer. See **THYLACINUS**, below.

The *Ursine Dasyure* (*D. Ursinus*) is not above half the length of the preceding: it lives on the shore, and feeds itself with its paws.

The *Long-tailed Dasyure* (*D. Macrourus*) is about the size of a Martin.

The *Maugean Dasyure* (*D. Maugei*)—Plate 10—is nearly the size of a Martin; snout and ears long; fur long and soft; in colour olive above, grey beneath, and spotted with white over the whole of the body: is a native of New Holland.

The *Viverrine Dasyure* (*D. Viverrinus*), about a foot in length. The *Tapha* (*D. Tafa*), similar to the last, but without spots. The *Brush-tailed Dasyure* (*D. Pencillatus*).

The *Yellow Dasyure* (*D. Minimus*) is the smallest animal in the genus, its body not being more than four inches long.

PHASCOLOGALE. This genus has been separated from the *Dasyuri* by Temminck in consequence of their having a false or single-pointed conical molar tooth more, and their incisive teeth being disposed in regular order. Of their habits nothing is known, excepting that it is said they are commonly found in trees, and rarely seen on the ground; but Temminck considers their molar teeth to characterise them as insect-eaters, and that in New Holland they occupy the place of the *Dasyures*.

The *P. Penicillata* is about the size of the Brown Rat, the body being eight, and the tail six inches long.

The *P. Minima* is rather less than the Garden Dormouse, the body being four and the tail two inches long.

THYLACINUS. This genus has been separated from the *Dasyuri* by their having four additional teeth in the upper jaw, a furred and non-prehensile tail, a head like a dog, and a greater arch and width of cheek.

The *Dasyurus Cynocephalus* (*T. Harrisii*) is the largest of the carnivorous marsupial animals: it is indeed nearly the size of a young wolf; the eyes are large, full, black, and furnished with a nictitating membrane, giving to it a very savage appearance; the ears are wide at their base, rounded at the tip, and covered with short hair; head very large, and mouth extending back nearly to the front corners of the eyes; legs short and thick, in proportion to the body; fore feet five-toed, with short, blunt, black claws, and a naked, callous heel; hind feet four-toed, with short claws, concealed by tufts of hair, extending an inch beyond them. The whole animal is covered with short, smooth, dusky, yellowish-brown hair. It is found in Van Diemen's Land, in the deep and almost impenetrable glens on the highest mountainous district, and is commonly known to the colonists as the *Zebra Opossum* and *Zebra Wolf*.

Family—INSECT-EATERS; *Insectivora*.

Genera.	Species.	Common Name.
Didelphis	Virgiana	Virginian Opossum.
Perameles	Obesula	Porcine Bandicoot or Peramale.

Another Genus of this family:—*Cheironectes*.

CHARACTERS OF THE GENERA.

1. **DIDELPHYS** (Gr. *δις*, twice, and *δελφύς*, a womb). Ten incisive teeth above, and eight below; seven molar on each side, of which the three first are flattened laterally and pointed; and the four last are multicuspid, the upper triangular, and the lower oblong; mouth very wide; muzzle sharp; ears large and naked; tail prehensile and scaly; five toes on each foot, distinct; the hind thumb long and much separated from the others; abdominal pouch,—its margin only distinct sometimes.

2. **PERAMELES** (Lat. *pera*, a bag, and *meles*, a badger). Incisive teeth in the upper jaw ten, the outer one far separated from the others, and in form resembling the cuspid; in the lower jaw six or eight; cuspid distinct, pointed, and larger than the incisive; molar either seven in each jaw, or eight in the upper and six in the lower, the anterior three or four compressed and cutting, the posterior studded with points; head very long and nose pointed; eyes lateral; ears of moderate size and obtuse; tail of moderate length, thick at its base, pointed, and having but few hairs on its upper surface; fore feet five-toed, the middle three longer than the others, and the inner, or thumb, nearly rudimentary; hind feet longer than the former, and four-toed, the inner two very small and enveloped in skin to the claws, the third the largest, and the outermost the smallest.

3. CHEIRONECTES (Gr. *χείρ*, a hand, and *νηπτής*, a swimmer). Incisor teeth, above ten, below eight; cuspidated teeth longer than the incisors; muzzle sharp: face hairy; eyes lateral; ears naked and round; tail scaly and voluble; feet distinct, pentedactylous, and the toes connected by webs; thumbs on the hind feet; nails hooked on the fingers and toes, but wanting on the thumbs.

INSECTIVORA.—DESCRIPTION OF SPECIES.

DIDELPHYS—*Opossum*. The *Didelphides* differ from the *Cheironectes*, in not having the feet webbed; from the *Dasyuri*, in having the tail prehensile and naked, and more teeth; and from the *Phalangista*, in having all the toes distinct from each other, and unconnected by skin.

Some of the genus possess an abdominal pouch, in which their young are carried; but others have only a fold of skin on each side of the bottom of the abdomen, forming as it were the rudiment of a pouch, and are said to carry their young upon their back: this circumstance has led to their division into two subgenera, and indeed some naturalists have divided them into distinct genera. Their tail is very long and prehensile, so that they are able to swing themselves from tree to tree like the Monkeys.

The Opossums are fetid, nocturnal animals, which move but slowly, and are great enemies to poultry and birds, the eggs of which, as well as the birds, they destroy; they live also upon fruit and nuts, and are omnivorous feeders. All are natives of America.

The mode in which the young animal is conveyed into the abdominal pouch of the parent is not at all understood, as they have not been known to breed in confinement. This bag is proper to the female, which, after the birth of the young, and their introduction into the pouch, closes it so firmly that it cannot be opened without the greatest difficulty: this power depends upon certain muscles attached to the bones which support the pouch laterally.



Opossum.

1. Opossums with pouches. The *Virginian Opossum* (D. *Virginiana*), about the size of a Cat, but of a thicker form; the fur of a dusky white colour, composed of woolly hair, like felt; ears thin, naked, and black, edged with white; head nearly entirely white; tail about thirteen inches long, covered with dusky hair at its root, but the remainder naked and covered with a scaly skin resembling the tail of a Snake, and prehensile; legs short; feet armed with claws, which are sharp, except the innermost, which is rounded like those of the Monkeys; belly whitish, and in the female thirteen teats, of which twelve are disposed in a circle, and one in the centre. It lives in the woods and fields, but at night sallies out in search of its prey, which consists of poultry and their eggs; but it also feeds upon fruits and roots. Its gait is very slow; but, like the Monkeys, it is very ready in getting from the branch of one tree to another, by means of its prehensile tail. The young ones when first littered are said not to weigh more than a grain, and become firmly attached to the teat, upon which they grow; and when they have acquired the size of a Mouse, which is about the fiftieth day, they leave the pouch, but quickly return to it on the slightest alarm; and they do not entirely leave it till they have acquired the size of a Rat. They go with young about twenty-six days. Native of America. (Plate 10.)

The *Cayenne Opossum* (D. *Marsupialis*), in size resembling the preceding, but the snout is longer, the mouth wider, and the skin of a yellowish-

brown colour. It is made use of as food, being considered delicate eating.

The *Molucca Opossum* (D. *Opossum*). This species, which is not so large, is considered by Dr. Shaw as a variety of the preceding; but it has been described as distinct by Daubenton. It is a native of the hot countries of South America.

2. Opossums with a longitudinal fold of skin on each side of the belly. The *Naked-tailed Opossum* (D. *Nudicaudata*), about the size of the *Molucca Opossum*, and nearly resembling it in colour: is a native of Cayenne. The *Large-tailed Opossum* (D. *Crassicaudata*), a native of Paraguay. The *Mexican Opossum* (D. *Cayopollin*), which is about nine inches in length; the *Woolly Opossum* (D. *Lanigera*), the *Murine Opossum* (D. *Murina*), an animal of a small and slender form, known as the *Wood Rat*. The *Touan*, (D. *Tricolor*), the *Short-tailed Opossum* (D. *Brachyura*), and the *Dwarf Opossum* (D. *Pusilla*), which is only about the size of a Mouse.

PERAMELES. All the animals belonging to this genus are natives of Australia; they are carnivorous, live in burrows which they dig with their fore feet, and move by a succession of leaps.

The species are—The *Porculine Opossum* (P. *Obesula*), which is about the size of the Common Rat; the head rather short and the forehead arched; the ears larger and rounded; in both jaws eight incisive teeth; the upper parts ferruginous-yellow, and the under white. Of this species Geoffroy has more recently made a distinct genus on account of the equal number of incisive teeth, which, however, seems scarcely sufficient cause for the separation. (Plate 10.)

The *P. Nasuta* is sixteen inches long; the *P. Bougainvillei* is but six inches in length, while the *P. Lawsonii* is two feet.

CHIRONECTES. The *Loutre de la Guiane* (C. *Guianensis*) is a little bigger than the Field Mouse. This animal is brown above, with three transverse greyish lines, broken in the middle, white below. Illiger has separated it from the genus *Didelphis*, on account of the feet being webbed.

Family—FRUIT-EATERS; *Frugivora*.

Genus.	Species.	Common Name.
Phalangista	- - - Gliriformis	- - - Mouse-like Phalanger.

Another Genus of this family:—*Petaurista*.

CHARACTERS OF THE GENERA.

1. PHALANGISTA (Gr. *φάλαγξ*, a joint). Head roundish, muzzle sharpish; incisive teeth in the upper jaw six, of which the middle two are long, narrow, and converging, and those on the sides very small, but the hindmost the largest; in the lower jaw two, twice as long as the middle upper teeth, inclined forwards and cutting; cuspid teeth two in the upper jaw, and instead of them in the lower, two or three little rudimental teeth, often not penetrating the gum; molar teeth in the upper jaw six, the first very small, and resembling a cuspid tooth, the second large and pointed, the four others tuberculated; in the lower jaw five molars, of which the first resembles the second upper, and the remaining four correspond to those above; ears short, or of moderate length; feet five-toed, the front toes disposed in a semicircle, and armed with strong, compressed, and sharp claws; the inner hind toe free, answering to a thumb, but nailless, the next two shorter than the others, and covered with skin to the last joint, so as to appear externally but a single toe with two claws; the outer two toes large; tail prehensile, in some covered entirely with hair, except just at the under part of the tip, but in others naked, and covered with rugosities.

2. PETAURISTA (Gr. *πέταυρον*, an instrument to throw stones, because the animal darts from branch to branch, as if shot from an engine). Incisive teeth, in the upper jaw six, of which the middle two are large and converging, in the lower jaw two, inclining forwards; no cuspid teeth, eight molar in the upper and seven in the lower jaw on each side, the anterior four upper and three lower conical, unequal, and resembling cuspid teeth, the other four tubercular; muzzle sharp; eyes prominent; ears hairy;

feet hairy, five-toed, and clawed, the second and third toes of the fore foot connected together; the skin expanded from the loins to the limbs, and sometimes from the neck also, forming a kind of sail.

FRUGIVORA.—DESCRIPTION OF THE SPECIES.

PHALANGISTA. This genus has been named from the inclusion of its second and third toes so completely together within the skin, as to appear but a single toe, were it not for the two distinct claws which project, although placed close to each other. They are covered with a close, soft, and thick fur. They make use of their strongly prehensile tail for hooking themselves to the branches of trees, among which they constantly live and doze through the day, and are found either suspended to or squatting upon the larger branches with their tail curled round them. They are not very active, and feed on all kinds of food, principally however on fruits, and it is believed also on insects. They have a very strong smell, but notwithstanding this their flesh is eaten. They are natives of the isles of the Indian Archipelago and of Australia. They are divided into Phalangers and Consous.

The *Phalangers* have the tail entirely or partially covered with hair; ears long and straight.

Species:—The *New Holland Bear*, or *Vulpine Phalanger* (*P. Vulpina*), measures about two feet in length, the tail is about eighteen inches long, and entirely covered with hair. It lives among the trees and in holes in the ground; is said to be omnivorous, feeding on young birds, vegetables, and fruit. In captivity they sit upright like Squirrels, and feed themselves with their fore paws.

The *White-tailed Opossum*, or *New Holland Opossum* (*P. Cookii*), from two to two and a half feet long, of which the tail measures twelve or thirteen inches. The *Dusky Phalanger* (*P. Fuliginosa*), about the size of the Vulpine. The *Yellow-footed Phalanger* (*P. Xanthopus*), same size as the last. The *Dwarf Phalanger* (*P. Nana*) is about the size of a Mouse, with a slender tail, similar to the last species.

The *Rufous-grey Phalanger* (*P. Gliriformis*), about the size of a Dormouse, the form of which it nearly resembles, except in being broader and flatter; eyes large and jet black; ears long, erect, entirely bare, mouse-coloured, and surrounded partially with a darkish ring in front, but interrupted behind by a white spot; face yellowish; upper and back part of the head reddish-grey, with a blackish ring about the eyes; body covered with soft thick fur of a grey colour, tipped with reddish-brown, and giving the coat a reddish-grey appearance; tail nearly as long as the body and head together, broad and thick from its base to half an inch of its tip, where it becomes contracted and gradually tapers to the end. In their habits they are very like the Dormouse, feeding on nuts and such-like food, which they take in their paws. They are nocturnal, come out late in the evening, run about with great activity, and employ their tail as a prehensile organ; sometimes they reverse it and turn it over their back, but when cold coil it up towards their under part, and almost between the thighs. (Plate 10.)

The *Couscous* are those with the tail almost entirely naked, and covered with rugosities; the ears short. The species are:—

The *Ursine Couscou* (*P. Ursina*) is about three feet four inches in length, of which the tail is nineteen or twenty inches. They are found in the thickets of the northern parts of the Celebes, where during daytime they are seen squatting on the branches of trees hidden by the leaves. Their flesh is eaten by the natives.

The *Golden-rumped Couscou* (*P. Chrysorrhos*) is about four inches shorter than the last species; the tail about thirteen inches in length. From the Moluccas.

The *Spotted Couscou*, or *Surinam Opossum* (*P. Maculata*), is about the size of our Common Cat, the whole length being nearly three feet, of which the tail has seventeen inches. Native of the islands of Amboina and Banda, where it is called *Coescos*, and of Waigiou, where it is named *Scham-scham*. Its flesh is of good flavour, and it is eaten by the natives.

The *Large-tailed Couscou* (*P. Macroura*) is about twelve inches to the base of the tail, which is seventeen inches long, and very large at its base. From Waigiou.

The *White Couscou* (*P. Cavifrons*), about the size of a Rabbit; the tail fourteen inches long. Native of Amboina and Banda; also in New Ireland, where it is common, and called by the natives *Kapoune*.

PETAURISTA. These animals differ from the Phalangers, with which they are included by Illiger, in having the skin extended from the sides of the body to the limbs, like the Galeopithèques among the Lemurida, and the Flying Squirrel among the Sciaurida, in the tail not being prehensile, and the crowns of the hinder molar teeth being tubercular, from which latter circumstance it is believed that they are not insect, but fruit-eaters, though of their habits little is known. They are all natives of Australia.

The *Black Hepoona*, or *Black Flying Opossum* (*P. Taguanoides*), measures about twenty inches in length from the tip of the nose to the root of the tail, is rather longer; the whole animal is covered with thick soft fur. The *Long-tailed Hepoona* (*P. Macurus*), about the size of the Brown Rat; also, the *Yellow-bellied Hepoona* (*P. Flaviventer*), the same size.

The *Squirrel-tailed Hepoona*, or *Norfolk Island Flying Squirrel* (*P. Sciurus*), about the same size as the preceding species. *Peron's Hepoona* (*P. Peronii*), about the size of the common Squirrel, and the *Pigmy Hepoona* (*P. Pygmaeus*), which is about the size of a Mouse.

Family—BURROWERS; Fodienta.

ILLUSTRATIVE EXAMPLES.

PLATE 11.		
Genus.	Species.	Common Name.
Phascolumys	Fuscus	Wombat.
Another genus of this family:—Phascolarctos.		

CHARACTERS OF THE GENERA.

1. **PHASCOLOMYS** (Gr. φασκόλος, a pouch, μῦς, a Rat). In each jaw two incisive teeth of large size with truncated crowns; no cuspid teeth; five molar on a side in each jaw, compound, and having the enamel rising around the edge of their crowns, the first on each side, both above and below, of an elliptical form, and small, the others each resembling two of these joined together, and twice their size; nose sharp; eyes lateral; ears of moderate length, and upright; head triangular when viewed in front; body bulky; fore legs capable of performing pronation and supination, and hind legs similarly circumstanced; feet plantigrade, the claws of the front toes strong, curved, and fit for digging; of the hind feet the thumb is short and nailless, and the second, third, and fourth toes connected together, and the fifth loose; tail very short.

2. **PHASCOLARCTOS** (Gr. φασκόλος, a pouch, and ἀρκτός, a Bear). Incisive teeth in the upper jaw eight, of which the middle two are very large and long, and the others very short and small; in the lower jaw two long ones; a large gap separates these from the molar teeth, and in it in the upper jaw on each side is a little, sharp, cuspid teeth, but in the lower there is not any; molar teeth five on a side in each jaw; their crowns deeply grooved, and forming two sharp edges; tail entirely deficient; legs of equal length and short, the fore feet having five toes, armed with short pointed claws, the inner two toes shorter, and opposable to the outer three; the hind feet four-toed, the thumb being deficient, and the two inner connected with each other.

FODIENTA.—DESCRIPTION OF THE SPECIES.

PHASCOLOMYS—*Wombat*, or the *Ursine Opossum* (*P. Bassii*)—is about two feet and a half long, or about the size of a Badger; short and thick-set in form, with a triangular-shaped head, a sharp snout and short limbs, and in its general appearance resembling a small Bear. The animal is covered with coarse hair about an inch and a half in length, thinnish on the belly, thicker on the back and head, but thickest on the loins and rump; the tail is naked, except a few short fine hairs near its tip; the colour is light

sandy-brown, varying in shade, but darkest on the back. The Wombat is a slow-moving animal, its pace hobbling or shuffling like that of a Bear. In disposition it is mild and gentle, but when provoked is furious.

The following account is given by Sir E. Home of the manners of his domesticated Wombat:—"It burrowed," says he, "in the ground whenever it had an opportunity, and covered itself in the earth with surprising quickness. It was quiet during the day, but constantly in motion during the night; was very sensible of cold; ate all kinds of vegetables, but was particularly fond of new hay, which it ate stalk by stalk, taking it into its mouth like a Beaver, by small bits at a time. It was not wanting in intelligence, and appeared attached to those to whom it was accustomed, and who were kind to it. When it saw them, it would put up its fore-paws on the knee, and when taken up would sleep on the lap. It allowed children to pull and carry it about, and when it bit them did not appear to do it in anger, or with violence. It appeared to have arrived at its full growth, weighed about twenty pounds, and was about two feet two inches long." It is found in the mountains near Port Jackson; and Captain Flinders says it is "called by the natives *Womat*, *Wombat*, or *Womback*, according to the different dialects, or perhaps to the different rendering of the wood-rangers who brought the information." Lesueur mentions that it is valuable for its flesh, which appeared to him preferable to that of all the other animals of Australia. (Plate 11.)

PHASCOLARCTOS—Koala. This genus, according to Goldfuss, forms the link between the Kangaroos and the Wombats, having the connected two inner hind toes of the former, and the bulky form of the latter.

The *Cinereous Koala* (*P. Cinereus*) is between two and three feet in length, the general form resembling that of a Bear; the ears are short, wide, and erect; the eyes lively, always in motion, sometimes fiery and threatening. Its fur is thick, consisting of soft fine hairs of a bluish-grey above, and white beneath, according to Goldfuss and Cuvier, but chocolate-brown in Blainville's description. It is generally seen sitting like a Dog, and the female carries her young on her back. It inhabits the forests of New Holland, about fifty or sixty miles south-west of Port Jackson, and was first brought to that settlement in August 1803. It climbs well, and lives on the tops of the blue gum trees, where it rests during the day, either sleeping or feeding on its tender shoots, which it prefers to any other food; in the night it descends, and prowls about, scratching up the earth in search of some particular roots. It seems to creep rather than walk, and when incensed or hungry utters a long shrill yell, and assumes a fierce menacing look. But in captivity it soon becomes attached to the person who feeds it. The New Hollanders eat its flesh, and are on this score readily induced to hunt in pursuit of it, climbing the gum trees for this purpose with great dexterity.

Family—LONG-FOOTED GRAZERS OR LEAPERS; *Salienta*.

These animals, owing to the shortness of their fore legs, can make but little progress in walking on all-fours; but this defect is compensated by their agility in leaping: hence their designation from the Latin *salientis*, "springing," or "leaping up."

Genera.	Species.	Common Name.
<i>Hypsiprymnus</i> - - - -	<i>Murinus</i> - - - -	Potoroo.
<i>Halmaturus</i> vel <i>Macropus</i> -	<i>Giganteus</i> - - -	Great Kangaroo.

CHARACTERS OF THE GENERA.

1. **HYPSPRYMNUS** (Gr. ὑψος, *high*, and πρύμνα, *a ship's stern*). Incisive teeth eight above, the last on each side distant from the others; the middle two slightly conical, straight, and four times the length of the others; incisive in the lower jaw, two inclined forwards; molar five on a side in either jaw, grinders, and tuberculated; snout sharp, upper lip cleft; ears long and rounded; whiskers half the length of the head; tail moderate sized, scaly, and slightly covered with hair; fore feet five-toed, the outer two toes the shorter; hind feet thumbless, four-toed, the inner two con-

nected, the middle twice as long as the others, and stronger; toes clawed, those of the fore feet adapted for digging.

2. **HALMATURUS** (Gr. ἄλμα, *a leap*, and οὐρά, *a tail*). Incisive teeth, six above of equal length, placed obliquely, two below long, large, sharp, and inclined so as to be on the same plane with the jaw; no cuspid teeth, but a large void space between the incisive and molar teeth, which vary according to the age of the animal, from four to seven on each side on either jaw, the anterior the smaller; their crowns tuberculated; upper lip cleft; head of a lengthened form; ears long and erect; eyes large; tail, in length equal to the body, covered with close hairs; limbs disproportioned to each other, the fore legs very short, five-toed, hind legs of great length, four-toed, the inner two very small and connected to the root of the claws, which are sharp; outer toe of moderate length; between it and the inner toes an enormously strong large toe, much exceeding either of the others in length and thickness, the last phalanx shod with a kind of hoof, as is also that of the outer; the metatarsal bones very long; when at rest the whole foot, even to the hock, resting on the ground; hair woolly.

SALIENTA.—DESCRIPTION OF THE SPECIES.

HYPSPRYMNUS—Potoroo. This genus is considered by Cuvier as connecting the predaceous with the herbivorous marsupial animals, from the former of which they are especially distinguished by the deficiency of the thumb on the hind foot. The length of their hind legs has given rise to their name; and in this circumstance they very much resemble the Kangaroos, to which, except in size and the disposition of the teeth, they approach very near: like them their progression is by leaping. Only one species is known.

The *Macropus Minor*, or *Lesser Kangaroo*, called also *Potoroo* (*H. Marinus*), is about the size of a Rabbit six months old, of a pale-brown mouse colour on the back, becoming lighter on the belly. Native of New Holland. (Plate 11.)

HALMATURUS—Kangaroo. Kangaroos were first discovered in the year 1770 by some of the navigators in Captain Cook's expedition to New Holland. Like the other marsupial animals, they are furnished with a bag attached to the lower part of the abdomen, and supported on the sharebones by a pair of bones peculiar to this order, in which the young animals are



Skeleton of Kangaroo.

received after birth, but when or how is not known, and here they remain attached to the nipple of the parent until they have attained sufficient size to shift for themselves; prior, however, to their finally quitting this bag, they occasionally leave it, in order probably to learn the method of providing for themselves, but upon the slightest fright they return to it again. The tail in this genus is of remarkable length and strength; it serves not only as a third resting-point when the animal is at rest upon its haunches, but answers the purpose of an offensive weapon, and is commonly employed in locomotion to assist in the astonishing leaps which the Kangaroos continually take in moving about, their progresses being a series of springs frequently of twenty feet at a time, and not walking on all four extremities, a position which they only assume when feeding. They are herbivorous, and have a remarkably curiously-shaped stomach, and a very large cæcum. They are harmless and inoffensive, except when quarrelling about the females, or when attacked. They have been naturalized in France and England.



Kangaroo.

The *Great Kangaroo* (H. Gigas): the largest species measures five or six feet from the tip of the nose to the root of the tail, which itself is about two and a half feet long; the skin is of a sooty-brown colour, deeper on the back than on the sides, and inclining to a light grey on the neck, chest, and belly. It is found on Kangaroo Island on the south coast of New Holland, where, Peron says, it is when sitting about the height of a man. (Plate 11.)

The *Moustached Kangaroo* (H. Labiatus) has been improperly called the Great Kangaroo, as it is at least a foot shorter than the last species. It is found in the neighbourhood of Botany Bay, Port Jackson, and the banks of the Endeavour River, New Holland.

The *Reddish-grey Kangaroo* (H. Rufogriseus) is about three feet and a half long from the snout to the root of the tail.

The *Red-necked Kangaroo* (H. Ruficollis) is not quite two feet in length.

The *Eugene Kangaroo* (H. Eugeniei) measures about twenty-two inches long.

The *Banded Kangaroo* (H. Fasciatus), and the *Lebrun Kangaroo* (H. Brunii), about two feet ten inches in length. This last is the only species not found immediately in New Holland, it being a native of the Aroe Isles, between New Guinea and Arnheim's Land, and also in the Isle of Solor, one of the Isles of Sunda.

Kangaroo-hunting is thus described in the Journal of Captain Gray. After representing the stealthy approach of a native, and the alarm of danger evinced by the animal on catching the sound of his enemy's footsteps, the Captain proceeds:—"About a hundred yards to the right of the native, you will see the Kangaroo erect upon its hind legs, and supported by its tail; it is reared to its utmost height, so that its head is between five and six feet above the ground; its short fore paws hang by its side, its ears are pointed—it is listening as carefully as the native, and you see a little head peering out from its pouch, to inquire what has alarmed its mother. But the native moves not, you cannot tell whether it is a human being or the charred trunk of a burned tree which is before you, and for several minutes the whole group preserve their relative position; at length the Kangaroo becomes reassured, drops upon its fore paws, gives an awkward leap or two, and goes on feeding, the little inhabitant of its pouch stretching its head further out, tasting the grass its mother is eating, and evidently debating whether or not it is safe to venture out of its resting-place, and gambol about amongst the green dewy herbage.

"Meantime the native moves not until the Kangaroo, having two or three times resumed the attitude of listening, and having, like a Monkey, scratched its side with its fore paw, at length once more abandons itself in perfect security to its feed, and playfully smells and rubs its little one. Now the watchful savage, keeping his body unmoved, fixes the spear first in the throwing-stick, and then raises his arms in the attitude of throwing, from which they are never again moved until the Kangaroo dies or runs away. His spear being properly secured, he advances slowly and stealthily, no part moving but his legs; whenever the Kangaroo looks round, he stands motionless in the position he is in when it first raises its head, until the animal, again assured of its safety, gives a skip or two and goes on feeding. Again the native advances; and this scene is repeated many times, until the whistling spear penetrates the devoted animal. Then the wood rings with shouts; women and children all join, pell-mell, in the chase; the Kangaroo, weak from the loss of blood, and embarrassed by the long spear, which catches in the brushwood as it flies, at length turns on its pursuers, and, to secure its rear, places its back against a tree, preparing at the same time to rend open the breast and entrails of its pursuer, by seizing him in its fore paws, and kicking with its hind legs and claws; but the wily native keeps clear of so murderous an embrace, and from the distance of a few yards throws spears into its breast, until the exhausted animal falls, and is then soon despatched; when, with the assistance of his wives, he takes the fore legs over his left, and the hind legs over his right shoulder, and totters with his burden to some convenient resting-place, where they can enjoy their meal."

ORDER V.—GNAWERS. RODENTIA.

THESE animals are unable to seize and tear living prey; but by their small and chisel-like teeth they can gnaw (*Rodo*, I gnaw) through some of the hardest substances of the forest, many of them feeding on the bark of trees, and even on wood. The natural divisions and connecting link of this order have not yet been as perfectly discovered, nor indeed do they appear to be so distinctly marked, as in other orders.



Teeth of Rodentia.

Family—WITH PERFECT COLLAR BONES; *Claviculata*.

The genera composing this family possess a well-developed clavicle; hence the appellation.

ILLUSTRATIVE EXAMPLES.

PLATE 12.

Genera.	Species.	Common Name.
Hypodæus - - - - -	Lemmus - - - - -	Lemming.
Myoxus - - - - -	Avellanarius - - - - -	Dormouse.
Casta - - - - -	Fiber - - - - -	Common Beaver.
Hydromys - - - - -	Coypu - - - - -	Molina's Coypu.
Mus - - - - -	Rattus - - - - -	Black Rat.
Dipus - - - - -	Jaculus - - - - -	Ægyptian Jerboa.

PLATE 13.

Pedetes - - - - -	Capensis - - - - -	Cape Jerboa.
Arctomys - - - - -	Alpinus - - - - -	Alpine Marmot.

Other Genera of this Family:—Fiber, Meriones, Myopotamus, Oudatra, Saccomys, Saccophorus, Sciurus, Spermophilus, Tamias.

CHARACTERS OF THE GENERA.

1. *HYPUDÆUS* (Gr. ὑπὸ, under, and οὔδας, the ground. Incisive teeth covered by the lips, two in each jaw, smooth in front, the lower having a wedge-shaped, rounded, cutting edge; molar three on a side in each jaw, the hinder the smallest, all placed close to each other, with broad crowns, having the ivory and enamel intermixed; snout short and obtuse; ears small and rounded; tail round, hairy, and short; toes distinct, five in front, or four with a thumb-nail and five behind.

2. *MYOXUS* (Gr. μῦς, a Mouse, and ὀξύς, sharp). Incisive teeth two in each jaw; the upper broadish and not grooved, the lower narrow and much sharper; molar teeth four on a side in each jaw, with distinct fangs and crowns marked with two kinds of transverse ridges by a double line of enamel; nose sharp; ears of moderate size; tail long, sometimes very hairy and round, at other times flattened horizontally, and the hairs standing out on the sides like the webs of a feather, and sometimes tufted at the tip; feet four-toed in front, with a rudimental thumb, five-toed behind; claws falcular.

3. *CASTOR* (Gr. κάστωρ, a Beaver). Tail flat, oval-shaped, and covered with scales; five toes to each foot, those of the hind feet webbed; grinding teeth four on either side in each jaw.



Molar Teeth of Beaver.

4. *HYDROMYS* (Gr. ὕδωρ, water, and μῦς, a Mouse). Molar teeth two on a side in each jaw; their crown obliquely quadrangular, and hollowed like a spoon; feet five-toed, the front toes distinctly divided, the hind either entirely or half-webbed; claws sharp, flattened; tail as long as the body.

5. *MUS*. Incisive teeth two in either jaw, those of the lower narrower and more pointed; molar three on a side above and below; of the upper, the first has six blunt tubercles, the first two of which are placed in transverse lines, and the next three in a second, and the sixth singly in a third; the second and third molars have four tubercles, of which one is placed in front, another behind, and two in the middle situated obliquely from without to within; of the lower, the first has five tubercles, a single one in front, the others in pairs, the second four in pairs, the third three, one in front, and a pair of tubercles behind; tail moderate-sized or long, ringed, scaly,

and generally but little covered with hair; front feet four-toed with a rudimentary thumb, hind feet five-toed; claws falcular.

6. *DIPUS* (Gr. *δις*, *twice*, and *πούς*, *a foot*). Two incisive teeth in each jaw; head broad; eyes prominent and large; hind legs very long; hair long, and tufted at the extremity.

7. *PEDETES* (Lat. *pes*, *a foot*). Incisive teeth two in each jaw, smooth in front, chisel-shaped, those of the lower jaw truncated and not pointed; molar four on a side in both jaws, their crowns rather cylindrical, surrounded by a circle of enamel, divided into two halves by a groove; head broad, and flat between the ears; muzzle obtuse, and terminating in a very short nose, in which the nasal openings appear as two clefts; upper lip entire, the edge joining on each side behind the incisive teeth so as to form a kind of pouch; whiskers very large and strong; ears long, narrow, and pointed; eyes large and low; fore legs short, and having five distinct toes, tipped with long, narrow nails, grooved, and fit for digging; hind legs very long, four-toed, the outermost toe the shortest and the inner the longest, the others of equal length, and all armed with very thick, straight, triangular, and pointed nails; tail long, very thick, and muscular, and entirely covered with longish hairs; four pectoral teats; and in the female an abdominal pouch, as in the Opossum, but not containing the teats.

8. *ARCTOMYS* (Gr. *ἄρκτος*, *a Bear*, and *μῦς*, *a Rat*). Two strong, sharp, wedge-shaped incisor teeth in each jaw; five tuberculated grinders on either side in the upper, and four in the lower jaw.

9. *FIBER*. Incisive teeth covered by the lips; six molars in each jaw; muzzle short and obtuse; ears hidden; tail long, flattened, and scaly; toes distinct, those of the hind feet increased in breadth by a lateral membrane; claws much hooked.

10. *MERIONES* (Gr. *μηρός*, *a thigh*). Incisive teeth two in each jaw; the front of the upper marked with a longitudinal groove; no cuspid; molar tritorial; nose sharp; lip cleft; ears not half so long as the head; tail moderate size, slightly ringed, covered with close hair; fore legs short, four-toed, hind legs three times as long as the fore, five-toed; claws moderate, fit for digging.

11. *MYOPOTAMUS* (Gr. *μῦς* *a Mouse*, and *ποταμός*, *a river*). Head large, muzzle obtuse; ears small and rounded, incisive teeth large and tinged with yellow; molar compound, four in each side in both jaws; tail long, conical, strong, scaly, and slightly covered with hair; feet five-toed, the thumb of the fore feet very short, the other toes unconnected; hind feet webbed.

12. *ONDATRA*. Incisive teeth large, the upper flatly rounded in front; the lower chisel-shaped, and nearly pointed at the tip; molar four on a side in either jaw; nose short, thick, and obtuse; eyes small, lateral, much hidden in fur; ears short, hairy, and scarcely distinguishable; body thick, flattish, covered with a long pile and close down; tail compressed laterally, and of nearly equal length with the body; thighs hidden in the body; feet five-toed; hind feet very large, toes distinct; middle two united by web; claws large, thin, slightly arched, and conical.

13. *SACCOMYS* (Gr. *σακκός*, *a pouch*, and *μῦς*, *a Mouse*). Incisive teeth chisel-shaped, two in each jaw; molar four on a side in either jaw; muzzle obtuse, upper lip cleft; cheek-pouches external to the mouth, and opening downwards; auricles large and elliptical; body short and covered with long silky hair; tail slender, long, and covered with verticillated square scales; feet five-toed; claws short, sharp, and compressed, excepting those of the thumbs of the fore and the second toe of the hind feet, which are straighter, wider, and flatter.

14. *SACCOPHORUS* (Gr. *σακκός*, *a pouch*, and *φέρω*, *to bear*). Incisive teeth two in each jaw, uncovered by the lips, chisel-shaped; molar, five on a side above, inclining obliquely backwards, and four below inclining forwards; head and trunk bulky; eyes small; ears short; cheek-pouches very large, unconnected with the mouth, but opening downwards and towards it; legs short; feet five-toed, the front claws very long and much curved, hind claws short; tail of variable length.

15. *SCIURUS* (Gr. *σκιά*, *a shadow*, and *οὐρά*, *a tail*). Incisive teeth two above, the upper with the front surface smooth, the lower much com-

pressed; molar teeth four on a side in either jaw, tubercular, and in the upper a fifth, which is very early deciduous; muzzle sharp, and upper lip cleft; eyes large and lively; ears oblong, sometimes tufted; tail distichous, or dichotomous, *i. e.* disposed in two rows like the barbs of a quill, or cylindrical; hind much longer than fore limbs; feet ambulatory, the anterior four-toed, with a tubercle in place of thumb, sometimes covered with a broad nail, the posterior five-toed; all the nails clawed.

16. *SPERMOPHILUS* (Gr. *σπέρμα*, *a seed*, and *φίλος*, *one who loves*). Incisive teeth chisel-shaped, two in each jaw; molar teeth five on a side above and four below; cheek-pouches; pupils oblong and vertical; auricles small and close to the head, their margins curled inwards towards the auditory passage; tail short, often distichous; legs long, with distinctly-divided toes.

17. *TAMIAS* (Gr. *τάμις*, *a storekeeper*). Incisive teeth two in each jaw; molar teeth four on a side in each jaw, and in the upper a fifth very small, rudimentary, and early deciduous; profile of the whole head curved and regular; cerebral cavity not occupying half the head; face narrow; muzzle sharp and upper lip cleft; large cheek-pouches; tail roundish, completely hairy, and as long as the body; feet four-toed in front, five-toed behind, and their claws not pointed.

CLAVICULATA.—DESCRIPTION OF THE SPECIES.

HYPUDÆUS—*Campagnol*. This genus has been separated from the Linnean genus *Mus* by Pallas; the animals are wild, and live in holes which they burrow in the ground. Some of them are natives of England, but the most destructive are found only in northern regions.

The species are—the *Water Rat* (*H. Amphibius*), about seven inches long; body covered with long black hairs, intermixed with reddish; belly iron grey; tail five inches long, covered with short hair. It lives on the banks of rivers in holes, which it digs in search of roots, on which it feeds.

The *Meadow Mouse* (*H. Arvalis*), which is about six inches long. These animals live in companies on high and dry lands, in burrows about six inches from the surface, and divided into several apartments, from which the pregnant female sinks a hole of two or three feet in depth, terminating in a chamber about the size of a man's fist, which she lines with dry grass, and in it drops six or eight young at a birth. It is common in England, and in France is a very severe scourge, not only devouring the seed as soon as sown, but destroying it during every period of its growth.

The *Economic Rat* (*H. (E)conomus*), so called from its habit of storing up food for the winter, is rather more than four inches long; is a native of Siberia and Kamtschatka, and said to be found occasionally in Switzerland and France. These Campagnoles present an instance of migration, but at uncertain periods; and the immensity of their numbers may be in some degree estimated, when it is stated, that travellers have been detained for two hours whilst the little four-footed army passed by.

We pass over the *Social Campagnol* (*H. Gregalis*), found in Siberia; the *Garlic Campagnol* (*H. Alliaris*), a frequenter of the rivers Lena and Jenesei; the *Red Campagnol* (*H. Rutilus*), of Siberia; the *Rock Campagnol* (*H. Saxatilis*), found in the Mongolian Desert, and proceed to give a brief notice of the *Lemmus*, a representation of which is contained in Plate 12. This animal (*H. Lemmus*) is about the size of our common Rat, and is covered with a very thin skin, the fur of which on the head and back is black and tawny, disposed in irregular patches, and the belly white tinged with yellow; its tail is not above half an inch in length. It inhabits Norway and Lapland, the country about the river Oby, and the northern part of the Uralian chain. It makes its appearance in these countries at irregular periods, sometimes after an interval of three years. It is probable that they migrate in consequence of want of food, and as they proceed they destroy everything, leaving a perfect waste behind them. Nothing stops their progress, neither rocks nor water; the former they compass, the latter they swim across, and although destroyed by thousands by the predaceous animals, more especially the Arctic Fox, they journey onwards in an unbroken and devouring mass. They move principally by night, and rest during the day.

MYOXUS—*Dormouse*. The Dormice are of an elegant form, and much resemble the *Mures* in their appearance. They feed on all kinds of fruit,

and climb trees with great facility in search of them. During the greater part of the day they sleep, and come out only at night. Having stored their holes with nuts, acorns, chestnuts, corn, &c., they fall asleep on the approach of cold weather, and remain torpid during the winter, except occasionally waking to feed, after which they soon fall asleep again. They are found both in Europe and America, and seem to form the intermediate link between Rats and Squirrels.

The *Common Dormouse* (*M. Avellanarius*) is about the size of a Mouse, and is the only species found in England; it inhabits Europe generally so far as Sweden. It lives in the hedges, makes its nest in a hollow tree near the bottom, or in a thick bush, consisting of grass woven together and of a round form, with a conical aperture at top. It brings three or four young, which soon quit the nest for habitations of their own; here they deposit their store of nuts, and coiling themselves up like a ball, pass the winter in a torpid state. When feeding, they sit up and hold their food like a Squirrel. (Plate 12.)

The *Fat Dormouse* (*M. Glis*), found in the south-western parts of Russia, Germany, southern France, Switzerland, Italy and Greece, but not in cold climates; it lives in the forests, climbs trees with great facility, and springs readily from branch to branch. This Dormouse, which is about the size of a Rat, was considered a delicacy by the Roman gourmands, who had their *Gliralia*, or feeding-places, for the purpose of fattening them properly.

The *Garden Dormouse* (*M. Nitela*), about an inch shorter than the last, is found in France and the south of Europe, in Poland and Prussia, in the gardens, and sometimes in houses. It brings five or six young at a birth. During the winter they collect in parties of eight or ten, and sleep together in the midst of their food.

There are several other species, but they are of less importance than those described.

CASTOR—Beaver. This curious genus of animals is particularly distinguished from others of the same order by its tail, which is remarkably broad and thin, and is covered with scales. The fore feet are small, but the hind feet are very large. The incisor or cutting teeth are remarkably large and strong, and as in the other genera of the *Rodentia* extend deeply within the jaws. They are possessed of inguinal pouches which secrete the substance known in Pharmacy as Castor or Castoreum, and is very valuable. The skins are important articles in commerce, being used in the manufacture of hats; the short downy part of the fur, which is close to the body and covered by the long, coarse hair, being employed for that purpose; but it is generally mixed with the downy fur of other animals. The black skins are esteemed most valuable, but the general colour is a dark chestnut-brown: white Beavers are very rare. In shooting the Beaver, the hunters endeavour to get to the side contrary to the wind, as the animal is very shy, is possessed of a keen ear, and has a fine scent; and this is generally done whilst they are at work or feeding. At other times they are taken in traps composed of the branches of poplars, to which is attached a log of wood, which falls upon the animal when it disturbs the trap by stripping off the bark of the sticks, of which it is very fond. During the frost, the hunter seeks his prey by making holes in the ice at a distance from the houses, over which he spreads large nets, and having broken down the huts, sends in Dogs trained for the purpose, which drive out the Beavers, which are netted in their attempt to escape through the holes in the ice. The last methods are preferred as doing less damage to the skin.

These animals spend the greater part of their time in the water, and live principally upon the bark and young branches of trees. They are found in the northern parts of Europe and Asia, but are most abundant in North America.

The *Castor Beaver* (*C. Fiber*) is about the size of a Badger; it is covered with a coarse fur of a ferruginous-brown colour, beneath which and close to the body is found a fine down; the eyes are large and black; ears short and hid in the fur; nose blunt; toes of the fore feet distinct, those of the hind feet webbed, and the second toe has an additional nail; tail about eleven inches in length and three in breadth.

The Beaver presents one of the strongest instances of instinctive sagacity

and industry which can be met with in the animal creation. It is gregarious, living in societies of two or three hundred, whose labours are employed for the general good, and their settlements are made either in ponds so deep as not to allow of their being frozen to the bottom, and which have a stream of water running through them, or in rivers themselves. Having determined on the place in which to erect their habitations, the first business consists in forming a dam; and for this purpose they stop the stream in the most favourable place for their operations. The dam is raised by driving stakes of five or six feet length into the ground at different distances, interweaving them with branches of trees, and filling up the interstices with clay, stones, and sand, which they ram down very firmly with their tails; the foundation of the dam is ten or twelve feet thick, the top is not more than two or three feet broad, presenting a perpendicular face to the stream, whilst the slope is placed on the outside, where as grass grows the dam is rendered more solid. In this way they build a dam not unfrequently a hundred feet in length. Within the embankment near the edge of the shore, are built the houses, which are from ten to twenty-five in number; these are raised upon piles, and sometimes consist of two or three stories, for the convenience of change in case of floods. The houses are of a round or oval form with a vaulted roof; the walls about two feet thick, formed of earth, stones, and sticks, but neatly plastered within; and to each are two entrances, one towards the water, and the other facing the land. Their height above the water is about eight feet. In each habitation reside from two to thirty Beavers, each animal having its own bed of moss, and each family its own winter stock of provisions, consisting of the bark and small branches of trees, which are kept in the water and fetched within as required. Whilst at work in erecting their dwellings one of the party acts as an overseer, and by striking his tail indicates which parts are weakest; and according to M. du Pratz, the same signal is made when they are disturbed, and are afraid of danger, on which account one is always placed as sentinel. (Plate 12.)

HYDROMUS—Coypu. The most remarkable external character of the Hydromures is the webbing of the toes, all of which are enveloped in membrane to the claws, except the outer, which is free. They differ from the Rats, in having but two instead of three molar teeth on a side in each jaw; so that they seem to connect the Beavers with the Rats, and are only found in the southern parts of the New World.

The *Mus Coypus* (*H. Coypu*) is the largest of the genus, being about twenty-one inches in length, and the tail twice as long. It is mentioned by Molina as in size and colour resembling the Otter. (Plate 12.) The general colour of the animal is reddish-brown on the back, but inclining to a bright brown on the sides, whilst the belly is of the same colour, but dull. It is a good-tempered animal, easily domesticated, and will feed on any kind of food; naturally it lives much in the water, but utters no cry, except when injured. It is found commonly in Buenos Ayres, Chili, and Tucuman, but rarely in Paraguay.

The *Yellow-bellied Coypu* (*H. Chrysogaster*) is about half the size of the last species, and is a native of Canal d'Entrecasteaux.

The *White-bellied Coypu* (*H. Leucogaster*), about the same size as the last, is a native of the Isle of Maria.

MUS—Rat, or Mouse. These animals differ materially in size, varying between twelve and two and a half inches. They are distinguished from the Dormice by the obtuse form of their head, by their less prominent eyes; from the Hamsters by not having cheek-pouches; from the Jerboas and others by the equal length of their legs, which are furnished with delicate toes armed with slender and pointed claws; the toes are not webbed like the Water Rats, nor have they the edges furnished with strong hairs like the Musk Rats. The length of the tail is very various, in some it exceeds, in others equals, and in some is less than that of the body. The greater number of Rats are covered with coarsish hair, but some few have the hair spiny. In their habits they are omnivorous, feeding indiscriminately on grain, roots, fresh and putrid animal matter, and hence are very frequently found in butchers' shops and slaughter-houses; but when impelled by hunger, they attack each other and the stronger feed on the weaker. Some

of them, but not all, lay up store of winter provisions, in burrows which they construct a slight distance below the surface of the ground. They multiply with great facility, and some of them live in the woods and fields, whilst others follow the steps of man, and colonize every part of the globe in which he settles, becoming one of his greatest pests: their increase on shipboard is often to such an extent that it becomes necessary to unload the vessel completely in order that these troublesome companions may be put to flight, or destroyed by starvation, which is the only remedy for their total removal.

The *Black Rat* (*M. Rattus*), represented on Plate 12, measures seven inches in length; the tail rather more. It is carnivorous; makes its nest in a hole near the chimney, and lines it with wool, bits of cloth or straw; is very courageous, and during rutting time often fights fiercely with its fellows. This was formerly the most common European species, but has given way to the *Brown Rat*, which exterminates it wherever they meet. It was introduced into South America about 1544, during the viceroyalty of Blasco Nunez, and is now a great nuisance throughout that continent.

The *Bandicote Rat* (*M. Giganteus*) is the largest species of the whole genus, the body including the head twelve inches, and the tail of equal length: body thick and arched, so that it has the appearance of a young Pig. It is found on the Malabar and Coromandel coast, in the Mysore, and in Bengal, between Calcutta and Hardwar, and is eaten by the poorer natives.

The *Brown Rat* (*M. Decumanus*) is about nine inches long, the tail of same length. It is originally native of India and Persia, whence it was introduced into England about the year 1730: in France it did not make its appearance till twenty years after, but since that time it has spread in every direction, and has been imported even into America. It is said that they have great aversion to the smell of Rabbits and Guinea-pigs, which are sometimes kept for the purpose of driving them away. Both in England and France they are now exceedingly common.

There are also the *Javan Rat*, the *Indian Rat*, the *Alexandrian Rat*, the *Velvet* or *Martinique Rat*, the *Caraco Rat*, and the *Brazilian Rat*: also the *Perchal Rat* and the *Cairo Rat*.

The *Common Mouse* (*M. Musculus*) is an elegant though destructive little animal: it is too well known to require description; the length of its body is about three inches and a half, and the tail of nearly equal length; it is covered with a sleek soft coat of hair. Several varieties of this species are found, a very common one of which are the *White Mice* with red eyes, which are merely albinos; others are yellowish, some light grey, some deep black, and others spotted with white. They increase rapidly, the female producing five or six young several times during the year. Nothing seems to come amiss to them; animal or farinaceous food, books, leather, and even linen, are continually subjected to the destructive attacks of such as live in houses, whilst those which inhabit the woods feed on roots and wild fruit. They do not become torpid by cold, and are found as well in the frozen regions of Iceland as in the warm climate of Egypt. This species was the *Mus* of the ancients.

The *Field Mouse* (*M. Sylvaticus*) is larger than the preceding, the body measuring above four inches, and the tail three and a half. They never frequent houses, but are found in woods, fields, and gardens, where they burrow and lay up great store of winter food, nuts, acorns, corn, &c., the scent of which attracts pigs, which do considerable mischief in their endeavours to rifle these magazines. Field Mice are very destructive to corn, and especially to beans which have been just sown, and hence in some parts of England they are called *Bean Mice*.

The other species are—the *American Field Mouse*, about four inches in length; the *Corn Mouse*, or *Shitnik* of the Russians; the *Wandering Mouse* and the *Beech Mouse*, both of Tartary; the *Dwarf Mouse*, of Strasburg; the *Oriental Mouse*, and the *Barbary Mouse*: also the *Short-tailed Mouse*, which burrows a little distance from villages, and the *Harvest Mouse*, found in Hampshire and other parts of England. The *Frugivorous Mouse*, the *Little Mouse*, the *Square-tailed Mouse*, and the *Lineated Mouse*.

DIPUS—*Jerboa*. Like the Kangaroo, the animals comprised in this genus

spring forwards instead of walking, a motion which is prevented by the shortness of the front extremities. Each fore foot has five toes; whilst in those of the hind feet, that portion of the metatarsus, or bones which support the toes, to which the three middle toes are attached, consists of a single piece like the metatarsal bones of birds. In some species there are also upon the sides of the hind feet little toes. These animals live in burrows, and during winter become torpid.

The *Arrow Jerboa* (*D. Sagitta*) is about the size of a Rat, and inhabits the northern parts of Africa.

The *Egyptian and Siberian Jerboa* (*D. Jaculus*) is larger than the preceding; the body is covered with long hair, ash-coloured at the bottom, and pale tawny at the ends. It inhabits Egypt, Barbary, Palestine, and the sandy tracts between the Don and Volga. The Arabs call it the Lamb of the Israelites; and it is believed to be the Coney of the Holy Scriptures, and the Mouse of Isaiah (ch. lxvi. 17). (Plate 12.)

PEDETES—*Jumping Hare*. At present there is known but a single species of this genus, the *P. Capensis*. It measures from the muzzle to the root of the tail sixteen inches, and the tail itself seventeen inches; the fur is light tawny. It is a native of the Cape of Good Hope, and called by the natives *Berg-haas* or *Spring-haas* (the Mountain or Bounding Hare). (Plate 13.) It sleeps during the day, and only moves out in twilight or in the night. When asleep, it separates its knees, puts its head down between its hind legs, and covers its ears and eyes with the fore feet. It is extremely timid, and on the slightest noise quickly buries itself.

ARCTOMYS—*Marmot*. The Marmots are about the size of our common Rabbit (*Lepus Cuniculus*); they are short-limbed, having four toes, with a very small thumb on the anterior, and five on the posterior extremities; have a short villous tail, the head large and flat, some species having ears, others none; the snout short and pointed, with a bilobed lip. They feed on roots and grain, occasionally also on insects; living in burrows carefully lined with moss, the entrance of which they stop up with hay during the winter, at which time they become torpid, and do not come out again till March; they litter early in the summer, bringing forth three or four young. They live in large societies, and in fine weather may be seen sporting about, and sitting upon their hind feet; during which time a sentinel is set, who, at the approach of danger, gives a shrill whistle, and they quickly disperse. They are easily tamed, and may be taught a number of tricks.

Plate 13 has a picture of the *Alpine Marmot* (*A. Marmotta*).

The *Bobac Marmot* of Russia, the *Earless Marmot* of Bohemia, the *Maryland Marmot*, the *Quebec Marmot*, the *Mauline Marmot*, and the *Hoary Marmot*—belong also to this genus.

FIBER—*Musk Beaver*. About the size of a Rabbit; lives upon acorns; and is a native of Canada.

MERIONES—*Hereen*. They nearly resemble the animals of the genus *Dipus*. The *Bay Hereen* are very numerous on the plains of Hindūstan, in dry stations, and at a distance from any water; very destructive to the grain, of which they lay up stores in their neighbouring burrows.

The *Tamarisk Hereen*, and the *Egyptian Hereen*, with a few others, belong to this genus.

MYOPOTAMUS—*Coypu*. The single species (*M. Bonariensis*) of which this genus consists very much resembles, in its general character, the Beavers; it however differs remarkably in the conical form of the tail: it is found throughout the greater part of South America.

ONDATRA—*Musquash*. One species of *Musquash* (*O. Zibethicus*) is fourteen inches in length, and its tail is eight and a half; its fur, which resembles that of the Beaver, is of a dark umber-brown. The *Musquash*, particularly the male, in the spring time, has a strong musky smell; it is however eaten by the Indians, and prized by them when fat; it somewhat resembles flabby pork. According to Richardson, this animal is not found lower than latitude 30°, and he has found them as high as 69°, near the mouth of the Mackenzie River. They prefer small grassy lakes, swamps, or the grassy borders of flowing streams where the bottom is muddy; and they feed chiefly on vegetable substances. They produce three litters in the course of the summer, each consisting of from three to seven young.

Three varieties of the Musquash have been observed; one entirely black, which is very rare, another pied with blackish-brown patches on a white ground, and a third white or albino, which is not very rare.

SACCOMYS—*Pouched Mouse*. The species *S. Anthophilus* is a native of North America; it is clothed with a silky fur of a light tawny-brown colour, and its habits are not very dissimilar to those of Squirrels.

SACCOPIORUS—*Pouched Rat*. The species are—the *Canadian*, the *Mexican*, the *Columbian*, the *Umber*, and the *Mole-shaped Pouch Rat*—all natives of America.

SCIURUS—*Squirrel*. The Squirrels are remarkable for the elegance and activity of their motions, as well as for personal beauty, which is materially increased by their extreme cleanliness. They are especially formed for climbing, and their muscular strength is very great. The springs which they take from branch to branch, or from tree to tree, whilst playing with each other, or in avoiding pursuit, are very astonishing; and if no tree be sufficiently near for them to spring to, they drop, without injury, to the ground from heights which might be expected to crush them. On the ground they move by repeated short leaps, whilst their long tail waves gracefully over them. When listening or feeding, they sit upright on their haunches, with the tail raised against the back, and its point gradually dropping towards the ground. They hold the nuts, upon which they mostly feed, principally between the rudimental thumbs and adjoining palms, turning the nut about till the thinnest part of the shell is found, into which a narrow aperture is soon made with the teeth sufficient to admit the points of the lower front teeth, by which successive pieces of the shell are broken off till the kernel is exposed. As their food is not to be obtained throughout the year, they lay up hoards of nuts and grain against the winter, and so well do they remember where these deposits are made, that they have no difficulty in finding them even when deeply covered by snow. To these they occasionally resort, when the weather is fine,

to feed, and then returning to their nest or *drey*, as it is called, and which is usually but at a short distance, fall asleep, and continue till awakened by the calls of hunger: they cannot therefore be said to hibernate completely. They build their nests in holes of trees, or in the forks of their branches, and the nest consists of sticks and moss laid together and lined with fur, which the female pulls from her breast when about to bring forth her young. They are extremely prolific when undisturbed, and commit great ravages in the fields: this was and still is the case in America and India, where the country is not so thickly inhabited. Godman mentions, that in the United States they in some seasons migrate in large bodies from one district to another, and are not stopped in their course, although great numbers are destroyed by beasts and birds of prey, and in crossing the rivers. They are generally distributed throughout all parts of the world, except in New Holland, and live in the woods.

True Squirrels have the tail dichotomous; profile nearly vertical; brain-case exceeds two-thirds of the length of the head; in some the ears are tufted, but in others plain. They are thus divided:—1. Those with the ears tufted: the *Common Squirrel* (*S. Vulgaris*), the *Alpine*, the *Malabar*, the *Madagascar*, the *Great-tailed*, the *Hudson's Bay*, and *Elphinstone's Squirrel*. 2. Those with ears not tufted: the *Cat Squirrel*, the *Fox*, the *Grey*, the *Black*, the *Varied*, the *Plantain*, the *Javan*, the *Golden-bellied*, the *Blackish*, the *Black-banded*, the *White-striped*, the *Anomalous*, the *Ocular*, the *Congo*, *Leschenault's*, *Clark's*, and *Prevost's Squirrel*.

The *Guerlingets* have the tail cylindrical or dichotomous only at its tip; middle of the forehead deeply flattened, its upper part elevated, as are also the upper and hind parts of the head; the breadth of the forehead equal to its height, and the brain-case forming two-thirds of the length of the head;



Squirrel.

ears not tufted. They include—the *Double-banded*, the *White-banded*, the *Beautiful*, and several other species of Squirrel.

SPERMOPHILUS—or *Spermophile*. These animals differ from the Marmots in a few particulars, thereby forming a transition from the Marmots, *Arctomys*, to the Ground Squirrels, *Tamias*, and are found in the northern parts of Europe, Asia, and America, and the intervening islands.

TAMIAS—*Ground Squirrel*. These animals differ from the *True Squirrels* (*Sciurus*) in a few anatomical characteristics, and still more so in their habits. Their claws are less sharp than in the Squirrels, which, together with the soles of the feet not being capable of inclination towards each other, render them less suited to climb trees, although enabling them to move along the ground and to dig their burrows with greater facility; hence their common name of *Ground Squirrels*.

Among the species we find the following:—the *Striped*, the *Four-lined*, the *Hudson's Bay*, and the *Line-tailed Ground Squirrel*—all natives of the New World.

Family—WITH IMPERFECT COLLAR BONES; *Hemiclaviculata*.

The clavicle in the members of this family is so imperfectly developed as to merit the designation given them; that organ being so small as scarcely to fulfil its proper functions.

ILLUSTRATIVE EXAMPLES.

PLATE 13.

Genera.	Species.	Common Name.
Lepus - - - - -	Timidus - - - - -	Common Hare.
Lepus vel Lagomys - - - - -	Pusillus - - - - -	Calling Hare.
Pteromys - - - - -	Sabrinus - - - - -	Great Flying Squirrel.
Hystrix - - - - -	Cristata - - - - -	Common Porcupine.

Other Genera of this Family:—*Bathyergus*, *Canà*, *Cheiomys*, *Chloeromys*, *Celogenus*, *Hydrochaerus*, *Loncheres*. We may also add the genus *Spalax*, family *Murides*.

CHARACTERS OF THE GENERA.

1. **LEPUS**. Incisive teeth, four in the upper jaw, placed in two rows, the front two large, wedge-shaped, grooved longitudinally in front, the hind two very small, cylindrical, and flattened from before to behind, and applied closely to the back of the first row; two in the lower jaw wedge-shaped also; no cuspid teeth; molars six of a side in the upper jaw, the hind one very small, five below, their crowns flat with transverse projecting edges of enamel; muzzle sharp; ears long; body covered with hair; tail very short, generally turned up; teats pectoral and inguinal; fore legs short, five-toed, hind legs very long, four-toed; soles of the feet hairy; claws falcular.

2. **PTEROMYS** (Gr. πτερόν, *a wing*, and μῦς, *a mouse*). Incisive teeth two in each jaw, the upper wedge-shaped, and their anterior surface smooth, lower compressed and pointed; molar teeth five on a side in the upper and four in the lower jaw, close set, simple, tritorial; muzzle bluntish; upper lip cleft; ears roundish; fore feet four-toed, and with a thumb; hind feet five-toed; skin of the sides of the body extended to the limbs, and forming a kind of false wing; tail long, roundish, and hairy.

3. **HYSTRIX** (Gr. ὄπισθ, *a hair or bristle*). Incisive teeth two in each jaw, wedge-shaped, molar five on a side in each jaw, cylindrical; body covered with strong and sharp quills, projecting beyond others shorter, or from among hair or wool; tail variable in length; feet four-toed in front, five-toed behind, armed with strong claws.

4. **BATHYERGUS** (Gr. βαθύργειν, *to work deeply in the earth*). Incisor teeth large, not covered by the lips, and wedge-shaped; canine none; grinders four on either side, above and below, the posterior sloping deeply outwards; muzzle broad; eyes small; auricles none; tail short and bristly; toes five on each foot, short and armed with thin flat nails.

5. **CAVIA**. Four toes before, and three behind, separate and armed with broad nails; the molar teeth having but a single lamina notched singly on the inner edge in those of the lower jaw, and on the outer edge of those in the upper; no tail.

6. CHEIROMYS (Gr. χείρ, *a hand*, and μῦς, *a mouse*). Lower incisors very narrow and much extended behind, resembling ploughshares; feet pentadactylous, four of the toes on the anterior much elongated, and the middle one very slender; on the posterior the thumb is opposable to all the toes.

7. CHLOROMYS (Gr. χλωρός, *green*, and μῦς, *a mouse*). Four grinding teeth on either side; those of the upper jaw sloped on the inner edge, those of the lower on the outer edge; four toes before and three behind, which are twice as long as the former, and of them the middle toe rather the longest.

8. CŒLOGENUS (Gr. κοίλος, *hollow*, and γένυς, *a cheek*). Four grinding teeth on each side, of a rounded shape; four toes, with a very small one on the inner edge of the fore feet, and five on those behind; deep hollow in the cheek.

9. HYDROCHÆRUS (Gr. ὕδωρ, *water*, and χοῖρος, *a pig*). Nose sharp, obliquely truncated at the tip, and flattened from above; upper lip entire; molar teeth four on each side in each jaw; body covered with rough wiry hair, tailless; feet half webbed, four toes before and three behind, furnished with claws.

10. LONCHERES (Gr. λόγχη, *a spear*, and αἶρω, *to take*). Incisive teeth two, above and below, chisel-shaped; molars grinding, five on each side; muzzle sharp, compressed; ears short, rounded, naked; body hairy, intermingled above with long, flattened spines, having lancet-like edges; tail long, scaled, and hairy; feet four-toed in front, with a flat thumb-nail, five-toed behind; claws curved.

11. SPALAX (Gr. σπάω, *I root out*). Incisive teeth in each jaw two, chisel-shaped; molar teeth three on a side in each jaw, tubercular; aperture of the mouth very narrow, and upper lip deficient: muzzle flat above and rounded in front; no external aperture in the skin for eyes; no auricles, but the auditory passage surrounded with a cartilaginous ring, and almost entirely hidden in the fur; neck very short, and of equal bulk with the cylindrical body; tail deficient; legs short, five-toed, their nails weak, flat, and slightly curved.

HEMICLAVICULATA.—DESCRIPTION OF THE SPECIES.

LEPUS—*Hare, Rabbit*. The Hares are generally remarkable for their extreme timidity; but their inability to save themselves from the attacks of their enemies by resistance has been amply compensated by the quickness of their hearing and sharpness of vision, which warn them of the coming danger, and by the swiftness of foot with which they are endowed in order to escape it. They never run, but their motions consist of a succession of leaps more or less extended, according to the speed with which the animal moves; for this purpose is given the great length and strength of their hind legs, which very much exceed those before; they are further assisted by the extreme flexibility of the spine, which enables them to bring the hind feet even before the front, and thereby throw the body forward with a much stronger and greater spring; and to give an idea of the prodigious leaps they make, it may be here mentioned, that one species has been known to pass over twenty-five feet at a single bound. This structure, though well adapted for moving on a level surface, and much more for going up hill, is disadvantageous for descent; and, consequently, if a Hare descend a steep place at speed, she may be noticed rolling over and over frequently before she reaches the bottom.

The general colour of the genus approximates more or less to reddish or greyish brown, dependent on the colours with which each hair is commonly tinged, being usually black at the root, tawny in the middle, and greyish at the tip. Many of them, however, change colour in the winter, and become mostly white: this happens in such as are located in cold climates; and in some which live in high northern latitudes, the coat is always white. It does not appear that this change from the darker summer colours to the wintry white is effected by the shedding of the coat and putting out of fresh fur, but by an actual change in the colour of the fur itself. Having once changed, however, there is no recurrence to the original colour, but

the coat continues the same till cast in the spring, when the dark summer colour is put forth, which is subsequently changed in the autumn.

The animals composing this genus are herbivorous: they feed at night, and may be seen, when the moon shines, gambolling about with great vivacity. It is a very curious fact with regard to Rabbits, that if once domesticated, they lose their disposition to burrow, and the produce of tame Rabbits do not attempt such a proceeding for several generations. Hares and Rabbits are used for food, and their hair is employed largely in the manufacture of hats, excepting some of the finer kind of Rabbits, of which the skin, after being dressed, is converted into fur.

Various have been the endeavours to arrange the species of this genus under the two divisions of Hares and Rabbits; but though every one is fully capable of distinguishing the one from the other, yet still so close is the resemblance between them, that it is extremely difficult to point out any distinctive characters. Besides which, the habits of the two genera so closely resemble each other, that it may be matter of doubt whether there is any advantage in separating them.

The subgenera are—*True Hares* (Lepores), and the *Calling Hares* (Lagomures). The former have incisor teeth chisel-shaped; tail varying in length, but distinct. Species—the *Common Hare* (L. Timidus), which measures about twenty-two inches in length, has the ears about a tenth longer than the head. The Buck, or Jack Hare, is distinguished among sportsmen by his head being shorter, his ears greyer, and his shoulders redder than the Doe.

The Hare does not pair, but pursues the female by scent; they breed during the whole year, except about eight or ten weeks in the severity of the winter. The female goes about a month, and usually brings two, but sometimes three or four, and a rare instance is mentioned of seven at one kindle. When more than two are dropped, it has been observed that there is a white star on the forehead. When about to kindle, she seeks a thick brake, where she makes her nest and suckles the young about twenty days, from which time they separate in search of food, and make their seat about sixty or eighty paces apart. Shy and timid as they are, Hares may be domesticated, and even become attached to the persons by whom they are brought up. A very interesting account is given by Cowper, the poet, of three young Leverets which he tamed and brought up, and apparently without any great trouble.

In fighting, Hares strike with their feet, drumming upon the offender in a rather unmerciful manner. They live six or seven years; indeed, of Cowper's tame ones, one lived nine and the other twelve years. The old ones are known by the spreading of the cleft in the upper lip, the blunt, rugged claws, the dry, tough ears, and the closeness of the bones in the knee-joints; on the contrary, in the young, the cleft is narrow, and the claws smooth and sharp. (Plate 13.)

The *Rabbit* (L. Cuniculus) is of less size than the Common Hare, and has the ears, which are nearly naked, a little shorter than the head. They are found in the temperate and hot parts of Europe, and in the hottest regions of Asia and Africa. They are not originally natives of America, but in the southern part of that continent thrive as rapidly as in England. They are incapable of bearing cold, so that even in Sweden they require to be kept within the house.

Rabbits are extremely prolific, even to a proverb, littering six or seven times in a year, and bringing six or eight at each litter; from which Pennant has calculated that if not interfered with, the descendants of a single pair will amount to 1,274,840 in the course of four years, calculating at eight to each of the annual seven kindles; a number which Daniel considers overrated, as the wild Rabbit never produces more than eight at two successive kindles, and rarely above five. In Minorca they are very numerous, but their flesh is so rank as to be unfit for food; and in order to keep down their numbers, each individual is called out two days in a year to destroy them.

The Rabbit goes with young thirty or one-and-thirty days, but frequently kindles out of the warren, on account of the danger to which they would be there exposed from the buck's unnatural aversion to them. She digs a

hole about two feet in depth, lines it with fur from her own body and grass, and thus makes her nest, in which she disposes her young and suckles them early in the morning and late in the evening for six weeks; and when she leaves them in search of food, for the first three weeks, carefully stops up the hole with earth to protect them from vermin, after which time it is left open for the young to go in and out: at last she takes them to the warren, and her cares for them cease. Rabbits live to eight or nine years of age.

The other species of the true Hares are—the *Variable Hare*, found in the mountainous districts of Scotland and in more northern climes; the *American Hare*, the *Polar Hare*, the *Prairie Hare*, the *Brazilian Hare*, the *Moussel Hare*, the *Cape Hare*, and the *Baikal Hare*.

The second class, the *Lagomures*, have no tail; incisors gouge-shaped behind, forming on their margin three distinct points, of which the middle is produced by both teeth, molar teeth having the plates of enamel separated on the inner edge by a deep groove, legs short, voice very shrill.

Species—the *Calling Hare* (*L. Pusillus*), about six inches in length; ears nearly triangular; the fur is set in a very soft, thick down, both of a brownish-lead colour, the former greyish towards the end and tipped with black; under parts hoary with a yellow tinge; the eyes hazel and very prominent. Found in the south-east of Russia, in the hills south of the Uralian, and in the west of the Altaic Chain, and about the Irtish. They prefer sunny valleys, and burrow on the western side of the hills amidst the bushes; they leave but a narrow entrance to the long galleries in which they make their nests, those of the old ones and the females are numerous and intricate. They live very retired, and are rarely seen except when taken in the ermine-traps during the winter. Their cry is very peculiar, resembling the piping of a Quail, but deeper, and so loud as to be heard at the distance of half a German mile; it is seldom uttered in the day, except in cloudy and rainy weather, and is repeated four or six times at regular intervals. (Plate 13.)

The *Alpine Hare*, the *Little Chief Hare*, and the *Ogotoma*, of the Mongols, belong to this division.

PTEROMYS—*Flying Squirrel*. This genus is distinguished from the Squirrels, to which in form it is otherwise much allied, by the extension of the skin from the sides of the body to the hind edge of the fore limbs, and the front edge of the hind limbs forming a membrane somewhat resembling the wing of the Bat, but differing from it in not being supported by any bone. It is not, however, to be supposed that the animal is capable of supporting itself in the air by means of the flying membranes; their only purpose is that of a parachute, to prevent the animal dropping so directly down, as it would do without them, when darting from the higher branches of trees, and thus enabling them to dart more obliquely from place to place; but as a means of ascent their wings are of no use. They are nocturnal animals, feed on fruit, and are found in Asia and in North America. Length of the body twenty-three inches, and of the tail twenty-one; head small, muzzle sharp, and beset with stiff black whiskers; ears small and pointed; neck short. Is a native of Java and other Indian Isles; and, besides using its wings as a parachute, is said to cling to the branches of trees with its tail. (Plate 13.)

Other species—the *Bay Flying*, the *Dart Flying*, the *Bristle-cheeked Flying*, the *Pretty Flying*, the *European Flying*, the *American Flying*, and the *Hudson's Bay Severn River Flying Squirrel*.

HYSTRIX—*Porcupine*. The covering of these animals among the *Rodentia* resembles that of the Hedgehog among the *Sarcophaga*, and like it they are capable of raising the quills (which are much larger and stronger than in the Hedgehog) when irritated; in doing which the rattling of them makes a loud noise, and adds to the formidable appearance which the Porcupine then makes. All of them, except the crested species, have the tail long, and in some it is prehensile also. They live in burrows, and have much the same habits as the Hare and Rabbit. The grunt which they emit has caused their supposed resemblance to the Pig.

The *Crested Porcupine* (*H. Cristata*) is rather more than two feet in length; has a long crest of stiff bristles on the top of the head reclining

backwards. Native of India, Southern Tartary, Persia, Palestine, and Africa; it is also found wild in Italy, but is not indigenous, and seems to have degenerated, as its quills are shorter and crestless. The assertion of it shooting its quills is fabulous.

Other species—the *Brazilian Porcupine* (*H. Prehensilis*), the *Malacca Porcupine* (*H. Fasciculata*), the *Canada Porcupine* (*H. Dorsata*), and the *Long-tailed Porcupine* (*H. Macroura*), native of the Indian Archipelago.

BATHYERGUS—*Cape Mole Rat*. The two species, *B. Maritimus*, the African Rat, and *B. Capensis*, the Cape Rat, are both found at the Cape of Good Hope, and differ little from each other except in size. The former, called "Zand Moll," is about the size of a Rabbit; and the latter, known by the name "Bless Moll," is seven inches in length.

CAVIA—*Cavy*. This genus very much resembles the genus *Hydrochaerus*, from which it has been separated by Cuvier, because of the material difference in the structure of the teeth.

The *Rock Cavy* (*C. Aperea*) has the upper lip divided; ears short; upper part of the body black, mottled with tawny; throat and belly white. It inhabits Brazil, living in holes of rocks, and is hunted for food, being considered superior to our Rabbits.

The *Restless Cavy*, or *Guinea Pig* (*C. Cobaya*), has its upper lip half divided; ears large, broad, and rounded; hair coarse and bristly, like that of a Pig. This little animal is well known, being often kept in houses, under a supposition that its smell drives away the Rats. It is cheerful and lively, but very shy and timid, running about continually, and making a grunting kind of noise; is much attached to the female, for which the males often fight till one be killed. It is very prolific.

CHEIROMYS—*Aye Aye*. These animals differ from the *Sciuri* in shape of their teeth, and in having five toes on each foot. Natives of the Island of Madagascar.

CHLOROMYS. The animals which compose this genus differ from the *Cavia* in the form of their teeth; there are but two species, which are natives of America.

CŒLOGENUS. Of this genus there is but one species, the *Spotted Cavy* (*C. Paca*). They are sometimes called *Hog Rabbits*, and are natives of Brazil.

HYDROCHÆRUS—*River Hog*. This animal (*H. Paraguayensis*), which is about the size of a two-year old Hog, is a native of South America, living in fenny districts near the great rivers in large herds, and uttering a loud discordant cry, like the braying of an ass. It is the largest of all the *Rodentia*, except the Beaver, grows very fat, and its flesh is considered good eating. Mr. Darwin ("Journal," p. 49) makes mention of one which he shot at Monte Video, which weighed ninety-eight pounds; its length from the end of the snout to the stump-like tail was three feet two inches, and its girth three feet.

LONGCHÆRUS. Two species are only named, but we are ignorant of their peculiar habits.

SPALAX—*Slepez*, which in the Russian language means *blind*. This animal differs from the genus *Mus*, with which it was included by Linnæus, by the absence of a tail, by the deficiency of upper lip, by the breadth of the incisive teeth, by the absence of eyes and auricles, and by the fore feet having no thumb-nail. When the skin is removed from the head, a tendinous expansion is seen spread over the orbits, beneath which is found a little oblong glandular body, about the middle of which is a black spot representing the globe of the eye, which, when cut into, exhibits the proper coats and humours.

The species are two—the *Blind Slepez* (*S. Typhlus*), found in Asia Minor, Syria, Mesopotamia, Persia, and Southern Russia, between the Tanais and Volga. Its hearing is remarkably acute; its motions are quick, its step irregular and hurried; and it walks backwards nearly as well as forwards. Like the Mole, it lives in the most fertile plains in burrows at but little depth below the surface of the soil. It feeds entirely upon roots, and is a great plague to the agriculturist. The female produces two or four young at a birth.

The other species (*S. Javanicus*) is found in the Isles of Sonda.

ORDER VI.—EDENTATA. TOOTHLESS.

SOME of the animals composing this order are destitute of teeth in the fore part of their jaws, while others are totally destitute of them. In the Cuvierian system they are known as Edentata.

ILLUSTRATIVE EXAMPLES.

PLATE 14.

Family—SLOW-MOVERS; *Tardigrada*.

Genus.	Species.	Common Name.
Bradipus - - -	Tridactylus - - -	AI or Three-toed Sloth.

Other Genera of this Family :—Megalonyx, Megatherium.

CHARACTERS OF THE GENERA.

1. BRADYPUS (Gr. βραδύς, *slow*, and ποῦς, *a foot*). Molar teeth cylindrical, canine, and pointed; hind feet articulated obliquely with the legs; the toes furnished with long claws, enveloped in skin as far as the roots of the nails; fore extremities very long, so that in walking the animal trails along on its elbows; pelvis very wide, so as to prevent the apposition of the knees.

2. MEGALONYX (Gr. μέγας, *great*, and ὄνυξ, *a claw*). Molar tooth cylindrical, simple, the interior bony, surrounded externally with enamel; claw-joints of the feet resembling those of the Sloth.

3. MEGATHERIUM (Gr. μέγας, *great*, and θηρίον, *a beast*). No cuspid teeth; four molars in each jaw: feet three-toed both in front and behind, the toes of unequal size, and formed to support great claws; tail, if any, very short.

TARDIGRADA.—DESCRIPTION OF THE SPECIES.

BRADYPUS—*Sloth*. Of all the animals in the creation, those which compose this genus would seem to be the most ill-conditioned and defenceless; but they are not so, being equally well suited to the situation in which they are placed, as those animals upon which nature has bestowed more personal beauty and activity. They have derived their generic name from the extreme tardiness of their motions. The stomach consists of four pouches, which however are not plaited or corrugated as those of ruminant animals; and the intestinal canal is very short and without any cæcum. They live mostly on trees, and bring forth one at a birth, which they carry on their backs.

The *Three-toed Sloth* (B. Tridactylus) is about the size of a large Cat; head flat, with a blunt black nose; small heavy eyes; general colour dusky brown; tail short; three long claws to each hand and foot; the fore extremities twice as long as the hinder. It is a native of South America, where it lives among the trees, climbing with great labour; and when it has procured as much food as it chooses, it forms itself into a ball, and drops to the ground to save the toil of descent. It has a very curious and plaintive cry, according to Kircher, in an ascending and descending hexachord. It is very patient of hunger, and one which had suspended itself on a pole lived without food for forty days. (Plate 14).

The *Two-toed Sloth* (B. Didactylus) is a native of America: a specimen of it in the British Museum measures eleven inches.

MEGALONYX. An extinct genus of animals, of which only one species is known (M. Jeffersonii).

MEGATHERIUM. Another extinct genus, the fossil remains of which prove it to be the largest of any recent discoveries. Only one species (M. Cuvieri) is known. The first specimen was found in September, 1789, in the excavations on the banks of the river Luxan, near the town of that name, about three leagues from Buenos Ayres, and at an elevation but little more than nine feet above the level of the stream; and from observations made then and subsequently on other specimens, it appears that the Megatherium resembles the Sloths in the head and shoulder, and the Ant-eaters and Armadillos in the singular commixture of the characters of the legs and feet, hence occupying an intermediate station between the Sloths and Armadillos.

Family—BANDED; *Cingulata*.

This family is so named because its several members are marked by rings or bands on the body and tail. Cingulata is from the Latin *cingula*, “a girth.”

Genus.	Species.	Common Name.
Dasypus - -	Novemcinctus - -	Nine-banded Armadillo or Tatou.

CHARACTERS OF THE GENUS.

1. DASYPUS (Gr. δασύς, *hairy*, and ποῦς, *a foot*). Body covered with a hard scaly coat, consisting of small compartments, and sometimes extending over the head and tail; the parts not defended by scales slightly covered with hairs; snout long; no incisor or cuspidate teeth; the molar teeth cylindrical, at a distance from each other, and numerous; claws very long, always five to the hind feet, and four or five to the fore feet.



Head of Armadillo.

CINGULATA.—DESCRIPTION OF THE SPECIES.

DASYPUS—*Armadillo*. These curious animals are known to the inhabitants of Guiana, by the name *Tattu*; they live in holes in the earth, which they are very expert in burrowing, and for which purpose their large claws are very advantageous.

The species are—the *Nine-banded Armadillo* (D. Novemcinctus), about three feet in length; the crusts on the shoulders and rump marked with small hexagonal plates; nine intermediate bands; colour black; breast and belly covered with long hairs; tail long, and covered with rings throughout nearly its whole extent. Sometimes this animal has but seven, and at other times eight bands; and is called, accordingly, *Septemcinctus* or *Octocinctus*. (Plate 14.)

Mr. Darwin speaks of four species; one of which (the *Mulita*) does not come so far south as Bahia Bancha. The three met with in that quarter are—the *Minutus* or *Pichy*, the *Villosus* or *Peludo*, and the *Apar*. “In the course of a day’s ride, near Bahia Bancha,” he says, “several [of the *Pichy*] were met with. The instant one was perceived, it was necessary, in order to catch it, almost to tumble off one’s horse; for in the soft soil the animal burrowed so quickly, that its hinder quarters would almost disappear before one could alight. It seems almost a pity to kill such nice little animals, for, as a Gaucho said while sharpening his knife on the back of one, ‘Son tan mansos’ (they are so quiet).”

The *Three-banded Armadillo*, shell about twelve inches long, the *Six-banded Armadillo*, the *Twelve-banded Armadillo*, and the *Great Armadillo*, some of which arrive at three feet in length, are all of this genus.

Family—ANT-EATERS; *Myrmecophagida*.

So named from the nature of their prey—μύρμηξ, *an ant*.

Genera.	Species.	Common Name.
Myrmecophaga - -	Jubata - - -	Great Ant-eater.
Manis - - -	Macroura - -	Long-tailed Pangolin or Manis.

The genus *Orycteropus*, which is not now of this family, may, with no great impropriety, be introduced at the end.

CHARACTERS OF THE GENERA.

1. MYRMECOPHAGA (Gr. μύρμηξ, *an ant*, and φάγω, *I eat*). No teeth of any kind; head not broader than the neck; nose much elongated and roundish; mouth very narrow; tongue very long, roundish, and projectile; body covered with coarse hair; tail of moderate length, in some species prehensile; fore legs longer and stronger than hind legs, which have four or five toes, whilst the former have only two or four, but all are connected with each other as far as the claws, which are falcular, and those of the fore legs very large.

2. **MANIS.** No teeth; head but little larger than the neck; muzzle long and attenuated, with the nostril slightly prominent; mouth small, terminal; tongue roundish, very long, and projectile; eyes small; external ears or auricles none; body covered with imbricated, scaly, osseous plates, having a few hairs interspersed among them; tail of moderate size, or very long, as large as the root of the neck at its base, slightly arched above and flat beneath; teats on the chest distinct; fore feet five-toed, hind feet four or five toed, the toes furnished with strong, curved claws.

3. **ORYCTEROPUS** (Gr. *ὀρύσσω*, *I dig*, and *πούς*, *a foot*). Head very long and nose taper; molar teeth six on a side in each jaw; tongue extensile; ears very long and pointed; fore feet four-toed, hind feet plantigrade and five-toed, all furnished with very strong claws nearly resembling hoofs, and fit for digging; tail long and rounded; skin very tough, similar to that of the *Pachydermata*, and covered with a few coarse hairs.

MYRMECOPHAGIDA.—DESCRIPTION OF THE SPECIES.

MYRMECOPHAGA—*Ant-eater*. The Ant-eaters are remarkable for the extremely small size of their mouth, and the total absence of teeth; their tongue is covered with a quantity of stiff, glutinous secretion, and when thrust into an Ant's nest, these animals become entangled in it, and the organ is then retracted into the Ant-eater's mouth. Their claws are well adapted for tearing up the ground or covering of the nests which they seek to rob; but in walking, they are folded into the soles of the feet against a large callosity, and the animal does not walk on the sole, but on the outside of the foot. Their motions are very slow; some of them live entirely on the ground, whilst others climb trees. They bring only a single young one at a birth, which they carry about on their backs. They are found only in America.

One of the species (*M. Jubata*), the *Great Ant-eater*, is represented on Plate 14. This animal measures from the nose to the root of the tail four feet, the tail itself is three feet. The eyes are rather small, deep set, and the lids not furnished with lashes; the ears small and round; the hair on the head very short. Tail round, covered with very large and crisp hairs from twelve to eighteen inches in length, and falling vertically on either side like a plume of feathers. The general colour of the head is grey and brown; of the upper part of the body and tail brown mingled with dingy white; chest and belly deep brown, inclining to black; the fore legs dingy grey; hind legs nearly black. Its only means of defence consist in hugging its enemy, for which purpose, when attacked, it prepares for the combat by sitting up on its haunches. Like the Sloth, when it has once laid hold of its opponent, it fastens its long claws into it, and retains it till life is extinct; and in this way it is said to be a match even for the very Panthers of America. The flesh of this Ant-eater, although having a strong taste, is eaten by the Indians.

Other species—the *Middle Ant-eater*, a foot long; the *Black Ant-eater*, and the *Double-striped Ant-eater*, about the same size; the *Lest Ant-eater*, and the *Ringed Ant-eater*, about the size of a Rat.

MANIS—*Pangolin*. The Pangolins live in burrows; they feed on worms and insects, principally on the termites and ants; they are weak and defenceless, so far as offensive weapons are concerned, but Nature has provided them with a coat of mail which protects them from injury; and when attacked they coil themselves up into a ball, like the common Hedgehog, and present a bristly surface, with which few animals are disposed to meddle. They are found in Asia and Africa.

The *Long-tailed Pangolin* (*M. Tetractyla*) is from two to three feet in length; the tail double the length of the body, and flattened; the head covered with small scales; those on the body brown, larger, and their edges carinated, placed in eleven longitudinal rows; the under parts covered with short, rough, blackish-brown hairs; claws brown; the fore feet have five, the hind feet only four toes. Native of Senegal. (Plate 14).

The *Short-tailed Pangolin* (*M. Pentadactyla*), a native of the East Indies, is about thirty-four inches long; and the *Javan Pangolin*, found in Java, measures thirty inches in length.

ORYCTEROPUS. This genus, on account of its food, was long confounded with the Ant-eaters, from which, however, it differs remarkably in having molar teeth, and in its nails being flat instead of sharp and cutting. There is but one species, the *Ground Hog* of the Cape Colonists (*O. Capensis*), which is about four feet; the tail is two feet long and tapering towards its tip; in shape it has been compared to the Hog, but the resemblance is not very close. They are much sought for as food by the Hottentots; but Le Vaillant says, that the flesh has a disagreeable taste, and smells strongly of formic acid. Is found in the neighbourhood of the Cape of Good Hope.

Family—WITH A SINGLE VENT; *Monotremata*.

Genera.	Species.	Common Name.
<i>Echidna</i> - - - -	<i>Hystrix</i> - - - -	Spiny <i>Echidna</i> .
<i>Ornithorhynchus</i> - -	<i>Paradoxus</i> - - -	Rnfous <i>Ornithorhynque</i> .

The genus *Pamphractus* is also of this family.

CHARACTERS OF THE GENERA.

1. **ECHIDNA.** Snout or bill elongated, and terminating in a small mouth, provided with a long extensible tongue; teeth horny, and placed on the tongue and palate; feet short, five-toed, with very long stout curved claws, fit for burrowing; body covered with spines.

2. **ORNITHORHYNCHUS.** Muzzle much elongated in form of a duck's beak, covered with horn, which increasing in thickness at the base, forms a kind of collar about the forehead and chin; true teeth none, but in their stead resting on the gums, but not implanted in the jaws, some flattened, quadrilateral, fibrocorneous substances, four in each jaw; head small and round; eyes small; no external ears; nostrils round, very close to each other; tongue large, broad, soft, fleshy, its edges furnished with tolerably large and black horny papillæ; cheek pouches; body nearly cylindrical; tail short, very wide, and flattened; legs very short and far apart; feet five-toed, flat-nails, and enveloped in a very wide membrane, which extends beyond the ends of the toes, forming a broad paddle with an irregular edge, hind toes connected only as far as the nails; on the inner hinder part of the heel a strong, pointed hollow spur, connected with a poison-bag.

3. **PAMPHRACTUS** (Gr. *πᾶς*, *all*, and *φράκτος*, *armed*). Maxillary teeth sharp; head narrower than the neck; snout lengthened and sharp; eyes small; auricles none; body and legs covered above with imbricated scales, naked beneath; tail of moderate length and scaly.

MONOTREMATA.—DESCRIPTION OF THE SPECIES.

ECHIDNÆ. This is one of the remarkable genera which have hitherto been discovered in New South Wales only, and which are provided with organs not found in any other known animals. The *Echidnæ* probably form the connecting link between the *Myrmecophagæ* and *Ornithorhynchi*.

The *Spina Echidnæ* (*E. Hystrix*), called also the *Aculeated Ant-eater*, is about seventeen inches long, from the tip of the bill to the tail, and the body of proportionable bulk; the upper part is covered with short coarse hair, from amongst which protrude numerous quills, similar to those of the *Porcupine*, but shorter, and which seem arranged in rows. The fore legs are short and thick; the hind legs are longer and at the junction of each hind leg with the foot is a small spur, slightly hooked.

There is another species called the *Hairy Echidnæ* (*E. Setosa*), which differs but little from the foregoing.

ORNITHORHYNCHUS. This curious genus was first brought into notice by Blumenbach in 1803, and named by him from the remarkable form of its muzzle.

The poisoning apparatus of this animal consists of the spur, which is situated on the inner and hinder part of the metatarsus of the male, and connected with a poison-gland, placed immediately under the skin and close to the hip-joint. The gland consists of numerous lesser glands connected together, and forming a mass about an inch long and half an inch wide; from it passes a canal, which descends behind the thigh and leg,

and terminates in a bag deeply situated in the hollow of the foot. From this bag another membranous canal passes to the spur, and is continued to the orifice in that organ. The poison appears to be active in reference to some animals, but according to M. Quoy's observations, it does not seem to have any great influence on man, nor is it at Port Jackson generally thought to be dangerous. In one of Mr. Darwin's excursions in Australia, he fell in with some of those animals: he thus writes,—“In the dusk of the evening I took a stroll along a chain of ponds, and had the good fortune to see several of the famous *Ornithorhynchus paradoxus*. They were diving and playing about the surface of the water, but showed so little of their bodies, that they might easily have been mistaken for *Water-rats*. Mr. Browne shot one: certainly it is a most extraordinary animal; a stuffed specimen does not at all give a good idea of the appearance of the head and beak when fresh; the latter becoming hard and contracted,” p. 442. They are very active, swim and dive well, and live principally in rivers and lakes, often rising to the surface to breathe.



Ornithorhynchus.

Two other species are known—the *Rufous Ornithorhynchus* and the *Dusky Ornithorhynchus*.

PAMPHRACTUS. The habits of this animal are not accurately known.

ORDER VII.—PACHYDERMATA. THICK-SKINS.

THIS order includes the Elephant, Rhinoceros, Tapir, Hippopotamus, Horse, and Pig; all characterised by the thickness of their skins. (Gr. *πάχυς*, *thick*, and *δέρμα*, *a skin*.)

Family—TRUNKED; *Proboscifera*.

The nasal organ in the members of this family is elongated, supple, and muscular. With it they carefully examine all objects brought before them, it being an organ both of touch and smell; hence the title proboscis from the Latin *probo*, “I prove, test, examine;” and *fera*, “bearing.”

ILLUSTRATIVE EXAMPLES.

PLATE 15.

Genera.	Species.	Common Name.
Elephas - - - -	Indicus - - - -	Indian Elephant.
Mastodon - - - -	Giganteum - - - -	Giant Mastodon.

CHARACTERS OF THE GENERA.

1. **ELEPHAS.** Incisive teeth in the upper jaw, projecting and forming tusks; none in the lower; molar teeth consisting of three distinct substances, bone, enamel, and *crusta petrosa*, and succeeding each other, as they are worn out, from behind.

2. **MASTODON** (Gr. *μαστός*, *a teat*, and *ὀδόνς*, *a tooth*). Incisive teeth in form of tusks, their transverse section presenting internal, curvilinear lozenges; molar teeth rectangular, consisting only of bone and enamel, without any cement, their crowns, when unworn by mastication, studded with large points in pairs, varying from six to ten, the hindmost having a

posterior stud, but when the points are worn down, presenting lozenges or trefoils in the different species; these teeth successive; lower jaw of greater comparative length than depth; neck short; seventeen pairs of ribs; limbs tall, five-toed.

PROBOSCIFERA.—DESCRIPTION OF THE SPECIES.

ELEPHAS. This genus includes the largest of the terrestrial animals, which, although of very unwieldy proportions, is capable, when tamed, of affording great services to man, and after death furnishes that important and useful article in commerce called ivory.

The head of the Elephant presents a remarkable peculiarity in the greatness of its depth, compared with its horizontal length, which proportionably exceeds even that of man, and depends upon the great extension of the cellular structure found in the upper and lateral parts of the bones of the skull, and the length of the sockets in which the tusks are inserted. In consequence of this, the opening of the nostrils, around which the root of the trunk is attached, is situated nearly in the middle of the face, and the bones of the nose are extremely small, to allow the free motion of that organ. The eyes are small, and the ears large, rounded, and pendulous. The trunk is the most remarkable organ possessed by this or any other animal; it consists of very numerous small muscles, interwoven in such manner as to form two parallel tubes, connected with the openings of the nostrils and the gristles of the nose, and so plentifully supplied with nerves, that it is endowed with an exquisite sense of feeling, and capable of performing very minute actions, even to the picking up of a pin; so that it may be considered to serve the animal not only as a breathing apparatus, but also as a hand, to which the “small moveable hook,” as Pennant calls it, or rather the finger-like projection at its extremity, seems nearly to assimilate it. The trunk is capable of extension and retraction, indeed of motion in every direction: by means of it the Elephant collects its food, and conveys it to the mouth, and, in drinking, the water is first drawn up into it, and then poured into its gullet; functions which are necessarily performed by it on account of the extreme shortness of the neck. The mouth of the Elephant is furnished with grinding teeth, which very much resemble those of the order *Rodentia*; they consist of three structures differing in density and hardness, and therefore constantly presenting a rough surface, for the trituration of the food previous to swallowing.

The most remarkable, however, of the Elephant's teeth are the tusks, which are commonly known as ivory: these are absolutely incisive teeth, being supported by those bones which in all quadrupeds form sockets for the incisive teeth. The tusks specially differ from the other teeth in being only shed once; the milk tusks never exceed two inches in length, they are cut between five and seven months, and are shed between the first and second year; soon after which the permanent tusks are cut, and gradually increases in size.

The permanent tusks vary considerably in size; in the female they are small, but in the male they become very large, weighing from fifty to one hundred and fifty pounds. The value of the Elephant's tusks is shown by Mr. Cumming, in the account he gives of his trading engagements:—

“Although I voted the trading an intense bore, it was nevertheless well worth a little time and inconvenience, on account of the enormous profit I should realise. The price I had paid for the muskets was 16*l.* for each case containing twenty muskets; and the value of the ivory I required for each musket was upwards of 30*l.*, being about 3000 per cent., which I am informed is reckoned among mercantile men to be a very fair profit.”

Again Mr. Cumming says:—

“While reviewing my extraordinary good fortune during the last week's hunting, I could not help deeply regretting that I had not earlier thought of pursuing the elephants at night with dogs and horses: if I had commenced with the dogs only a week sooner, I might have bagged eight or ten first-rate bulls, which I knew were mortally wounded, but were, nevertheless, not forthcoming. The ivory of these elephants would have brought me in upwards of 200*l.*; and it was vexing to think that many, if not all of them, were lying rotting in the surrounding forest.”

"When I shot an ordinary bull elephant, I was accustomed to say to myself, 'Ah! a good bull; tusks at least fifty pounds each; 4s. 6d. a pound; bring me in 22l. 10s. Capital day's work; help to pay for the two horses that died last week, or the four that are bitten with 'tsetse,' and must die in a week or two.' But if, on the other hand, I shot an elephant with a pair of tusks of unusual size, perfection, or beauty, I at once devoted them to my collection, and valued them at a tenfold price."

The height of Elephants which have attained their full growth is very rarely above ten feet, and one which measured ten feet six inches, belonging to the vizier of Oude, is mentioned by Mr. Corse as being remarkably tall. The standard height for Elephants in the East India Company's service is from seven feet upwards, measuring to the shoulder; but the curve of the back is much higher, particularly in the young animal, and decreases as it advances to maturity; so that the flattened back is a sure indication of old age.

Elephants go with young twenty months and eighteen days, according to the authority of Mr. Corse. When first born they rarely exceed thirty-four inches in height, and gradually increase till between twenty and twenty-four years of age, when they seemed to have arrived at maturity. The parent does not seem particularly attached to its offspring; for after having been separated from it a few days, she will take no notice of it, notwithstanding its cries and efforts to obtain its usual supply.

The sagacity of the Elephant has afforded much interest and amusement, from the astonishing facts which have been brought forward by zoologists in support of it. But if the subject be more closely inquired into, it will be found that this animal does not much exceed the horse in this quality, and, indeed, is far inferior to the dog.

Our plate contains a representation of the Indian Elephant (*E. Indicus*), found in Southern India, Ceylon, Java, and Sumatra.

When tamed the animal is remarkable for its docility, which has been mistaken by many naturalists for sagacity; but at the rutting season they must be kept low, or dangerous consequences may be the result, for at that season they are subject to paroxysms of rage which impel them to acts of violence.

The *African Elephant* (*E. Africanus*) is of less bulk than the Asiatic or Indian Elephant. It is now employed in that quarter of the world, as it still is in Asia, either for state, war, or carriage. At present they are merely hunted for sport, or for the purpose of obtaining ivory. This sport is attended with much danger, as the following extract from Mr. Cumming's book, already referred to, abundantly proves:—

"We proceeded silently as might be for a few hundred yards, following the guide; when he suddenly pointed, exclaiming, 'Klow!' and before us stood a mighty herd of mighty bull elephants, packed together beneath a shady grove about a hundred and fifty yards in advance. I rode slowly towards them; and as soon as they observed me they made a loud rumbling noise, and, tossing their trunks, wheeled right about and made off in one direction, crashing through the forest and leaving a cloud of dust behind them. I was accompanied by a detachment of my dogs, who assisted me in the pursuit.

"The distance I had come, and the difficulties I had undergone, to behold these elephants, rose fresh before me. I determined that on this occasion at least I would do my duty, and, dashing my spurs into 'Sunday's' ribs, I was very soon much too close in their rear for safety. The elephants now made an inclination to my left, whereby I obtained a good view of the ivory. The herd consisted of six bulls; four of them were full-grown, first-rate elephants; the other two were fine fellows, but had not yet arrived at perfect stature. Of the four old fellows, two had much finer tusks than the rest, and for a few seconds I was undecided which of these two I would follow; when, suddenly, the one which I fancied had the stoutest tusks broke from his comrades, and I at once felt convinced that he was the patriarch of the herd, and followed him accordingly. Cantering alongside, I was about to fire, when he instantly turned, and, uttering a trumpet so strong and shrill, that the earth seemed to vibrate beneath my feet, he charged furiously after me for several hundred yards

in a direct line, not altering his course in the slightest degree for the trees of the forest, which he snapped and overthrew like reeds in his headlong career.

"When he pulled up in his charge, I likewise halted; and as he slowly turned to retreat I let fly at his shoulder, 'Sunday' capering and prancing and giving me much trouble. On receiving the ball the elephant shrugged his shoulder, and made off at a free majestic walk. This shot brought several of the dogs to my assistance which had been following the other elephants, and on their coming up and barking another headlong charge was the result, accompanied by the never-failing trumpet as before. In his charge he passed close to me, when I saluted him with a second bullet in the shoulder, of which he did not take the slightest notice. I now determined not to fire again until I could make a steady shot; but although the elephant turned repeatedly, 'Sunday' invariably disappointed me, capering so that it was impossible to fire. At length exasperated, I became reckless of the danger, and, springing from the saddle, I approached the elephant under cover of a tree, and gave him a bullet in the side of the head, when, trumpeting so shrilly that the forest trembled, he charged among the dogs, from whom he seemed to fancy that the blow had come; after which he took up a position in a grove of thorns, with his head towards me. I walked up very near, and as he was in the act of charging, I (being in those days under wrong impressions as to the impracticability of bringing down an elephant with a shot in the forehead) stood coolly in his path until he was within fifteen paces of me, and let drive at the hollow of his forehead, in the vain expectation that by so doing I should end his career. The shot only served to increase his fury—an effect which, I have remarked, shots in the head invariably produce; and continuing his charge with incredible quickness and impetuosity, he all but terminated my elephant-hunting for ever. A large party of the Bechuans who had come up yelled out simultaneously, imagining I was killed, for the elephant was at one moment almost on the top of me: I however escaped by my activity, and by dodging round the bushy trees. As the elephant was charging, an enormous thorn ran deep into the sole of my foot, the old Badenoch brogues, which I that day sported, being worn through; and this caused me severe pain, laming me throughout the rest of the conflict.

"The elephant held on through the forest at a sweeping pace; but he was hardly out of sight when I was loaded and in the saddle, and soon once more alongside. About this time I heard Isaac blazing away at another bull; but when the elephant charged, his cowardly heart failed him, and he very soon made his appearance at a safe distance in my rear. My elephant kept crashing along at a steady pace, with blood streaming from his wounds; the dogs, which were knocked up with fatigue and thirst, no longer barked around him, but had dropped astern. It was long before I again fired, for I was afraid to dismount, and 'Sunday' was extremely troublesome. At length I fired sharp right and left from the saddle: he got both balls behind the shoulder and made a long charge after me, rumbling and trumpeting as before. The whole body of the Bamangwato men had now come up, and were following a short distance behind me. Among these was Mollyeon, who volunteered to help; and being a very swift and active fellow, he rendered me important service by holding my fidgety horse's head while I fired and loaded. I then fired six broadsides from the saddle, the elephant charging almost every time, and pursuing us back to the main body in our rear, who fled in all directions as he approached.

"The sun had now sunk behind the tops of the trees: it would very soon be dark, and the elephant did not seem much distressed, notwithstanding all he had received. I recollected that my time was short, therefore at once resolved to fire no more from the saddle, but to go close up to him and fire on foot. Riding up to him I dismounted, and, approaching very near, I gave it him right and left in the side of the head, upon which he made a long and determined charge after me; but I was now very reckless of his charges, for I saw that he could not overtake me, and in a twinkling I was loaded, and, again approaching, I fired sharp right and

left behind his shoulder. Again he charged with a terrific trumpet, which sent 'Sunday' flying through the forest. This was his last charge. The wounds which he had received began to tell on his constitution, and he now stood at bay beside a thorny tree, with the dogs barking around him. These, refreshed by the evening breeze, and perceiving that it was nearly over with the elephant, had once more come to my assistance. Having loaded, I drew near and fired right and left at his forehead. On receiving these shots, instead of charging he tossed his trunk up and down, and by various sounds and motions, most gratifying to the hungry natives, evinced that his demise was near. Again I loaded, and fired my last shot behind his shoulder: on receiving it, he turned round the bushy tree beside which he stood, and I ran round to give him the other barrel, but the mighty old monarch of the forest needed no more; before I could clear the bushy tree he fell heavily on his side, and his spirit had fled. My feelings at this moment can only be understood by a few brother Nimrods, who have had the good fortune to enjoy a similar encounter. I never felt so gratified on any former occasion as I did then."

Notwithstanding our limited space, we feel tempted to introduce Mr. Cumming's interesting account of the uses to which the natives convert the several parts of this animal:—

"The manner in which the elephant is cut up is as follows:—The rough outer skin is first removed, in large sheets, from the side which lies uppermost. Several coats of an under skin are then met with. This skin is of a tough and pliant nature, and is used by the natives for making water-bags, in which they convey supplies of water from the nearest vley or fountain (which is often ten miles distant) to the Elephant. They remove this inner skin with caution, taking care not to cut it with the assagai; and it is formed into water-bags by gathering the corners and edges, and transfixing the whole on a pointed wand. The flesh is then removed in enormous sheets from the ribs, when the hatchets come into play, with which they chop through, and remove individually, each colossal rib. The bowels are thus laid bare; and in the removal of these the leading men take a lively interest and active part, for it is throughout and around the bowels that the fat of the Elephant is mainly found.

"There are few things which a Bechuana prizes so highly as fat of any description; they will go an amazing distance for a small portion of it. They use it principally in cooking their sun-dried biltongue, and they also eat it with their corn. The fat of the Elephant lies in extensive layers and sheets in his inside, and the quantity which is obtained from a full-grown bull, in high condition, is very great. Before it can be obtained, the greater part of the bowels must be removed. To accomplish this, several men eventually enter the immense cavity of his inside, where they continue mining away with their assagais, and handing the fat to their comrades outside until all is bare. While this is transpiring with the sides and bowels, other parties are equally active in removing the skin and flesh from the remaining parts of the carcass. The natives have a horrid practice on these occasions of besmearing their bodies, from the crown of the head to the sole of the foot, with the black and clotted gore; and in this anointing they assist one another, each man taking up the fill of both his hands, and spreading it over the back and shoulders of his friend. Throughout the entire proceeding an incessant and deafening clamour of many voices and confused sounds is maintained, and violent jostling and wrestling are practised by every man, elbowing the breasts and countenances of his fellows, all slippery with gore, as he endeavours to force his way to the venison through the dense intervening ranks, while the sharp and ready assagai gleams in every hand. The angry voices and gory appearances of these naked savages, combined with their excited and frantic gestures and glistening arms, presented an effect so wild and striking, that when I first beheld the scene I contemplated it in the momentary expectation of beholding one half of the gathering turn their weapons against the other.

"The trunk and feet are considered a delicacy, and a detachment are employed on these. The four feet are amputated at the fetlock joint, and the trunk, which at the base is about two feet in thickness, is cut into

convenient lengths. Trunk and feet are then baked, preparatory to their removal to head-quarters. The manner in which this is done is as follows:—A party, provided with sharp-pointed sticks, dig a hole in the ground for each foot and a portion of the trunk. These holes are about two feet deep, and a yard in width; the excavated earth is embanked around the margin of the hole. This work being completed, they next collect an immense quantity of dry branches and trunks of trees, of which there is always a profusion scattered around, having been broken by the elephants in former years. These they pile above the holes to the height of eight or nine feet, and then set fire to the heap. When these strong fires have burnt down, and the whole of the wood is reduced to ashes, the holes and the surrounding earth are heated in a high degree. Ten or twelve men then stand round the pit, and rake out the ashes with a pole about sixteen feet in length, having a hook at the end. They relieve one another in quick succession, each man running in and raking the ashes for a few seconds, and then pitching the pole to his comrade and retreating, since the heat is so intense that it is scarcely to be endured. When all the ashes are thus raked out beyond the surrounding bank of earth, each Elephant's foot and portion of the trunk is lifted by two athletic men, standing side by side, who place it on their shoulders; and approaching the pit together, they leave it into it. The long pole is now again resumed, and with it they shove in the heated bank of earth upon the foot, shoving and raking until it is completely buried in the earth. The hot embers, of which there is always a great supply, are then raked into a heap above the foot, and another bonfire is kindled over each, which is allowed to burn down and die a natural death; by which time the enormous foot or trunk will be found to be equally baked throughout its inmost parts. When the foot is supposed to be ready, it is taken out of the ground with pointed sticks, and is first well beaten, and then scraped with an assagai, whereby adhering particles of sand are got rid of. The outside is then pared off, and it is transfixed with a sharp stake for facility of carriage.

"The feet thus cooked are excellent, as is also the trunk, which very much resembles buffalo's tongue. The reason why such large fires are requisite is owing to the mass of the flesh that must be baked. In raking the sand on the foot, the natives are careful not to rake the red-hot embers in with it, which would burn and destroy the meat; whereas the sand or earth protects it, imparting an even and steady heat. When the natives have cut up the Elephant, and removed the large masses of flesh, &c., to their respective temporary kraals around, they sit down for a little to rest and draw their breath, and for a short time smoking and snuffing are indulged in."

MASTODON.—The animals belonging to this genus are now extinct, at least they have not been met with alive in any part of the world which has been explored up to this time, but only in a fossil state, and till within the last few years, it was believed only in a certain district of North America. The diligent investigations of Cuvier, however, have proved that they are found not only in North America, but among the fossil remains of Europe. Humboldt has obtained specimens of the genus from South America; and very recently, Dr. Buckland and Mr. Clift have shown that they are found in Asia also, several parts of two new species having been brought by Mr. Crawford from the Birman Empire, and subjected to their examination.

The *Gigantic Mastodon* (*M. Giganteum*) measures about ten feet in height and fifteen in length, so that in the latter dimension it is four feet longer than an Elephant of the same height, which never exceeds eleven feet. It appears almost certain that the Mastodon fed upon soft vegetables, roots, or aquatic plants; that it was provided with a trunk; that in height it did not exceed the Elephant; and that it was not made like the Hippopotamus to live and swim about in the water, but was actually a terrestrial animal.

Several species have been found in various parts of the world.

Family—TRUNKLESS; Eproboscifera.

Destitute of the nasal elongation, or trunk, with which the former family is endowed.

ILLUSTRATIVE EXAMPLES.

PLATE 16.

Genera.	Species.	Common Name.
Rhinoceros	- - - - Indicus	- - - - Indian Rhinoceros.
Tapirus	- - - - Americanus	- - - - American Tapir.
Hippopotamus	- - - - Amphibius	- - - - Hippopotamus.

Another genus of this family is the well-known *Sus*.

CHARACTERS OF THE GENERA.

1. RHINOCEROS (Gr. *ῥίς*, the nose, and *κέρας*, a horn). Incisive teeth either deficient, or two in each jaw, or four in each jaw; no cuspids; molar seven on a side in each jaw, compound and tubercular; muzzle elongated, and the upper lip lengthened and moveable; upon the nose are placed one or two solid horns; eyes small and high up; ears much shorter than the head, with funnel-shaped bases; body covered with thick, tough skin, sparingly beset with hairs; tail short; feet three-toed, their joints enveloped in the skin as far as the nails, which are short, rounded, upright, and face forwards.

2. TAPIRUS. Incisive teeth six and cuspid, two in each jaw, the latter in the upper jaw very small; molar teeth on each side of the upper jaw seven, in the lower jaw six; upper lip and nose produced into a short, moveable, depending trunk, at the extremity of which are the broad transverse nostrils; ears of moderate size, oval; eyes small, dull; skin very tough, in two species covered thinly with close, smooth, short hair, in the third thickly with thick, long hair; neck in some species maned, in other not so; tail very short; two ventral teats; fore feet four-toed, hind feet three-toed, and the tips of all the toes enclosed in small hoofs.

3. HIPPOPOTAMUS. Teeth not projecting beyond the lips, of which the upper is large and thick; incisive four in each jaw; molars six on each side in either jaw; ears of moderate size and pointed; body slightly studded with hairs; tail short; mammae ventral; feet four-toed, enveloped in skin and each bearing a small projecting nail.

4. *Sus* (Gr. *σῦς*, a hog). Incisive teeth six in each jaw, or four in the upper and six in the lower jaw; cuspid teeth differing in form and direction in different species; molar seven or five on a side in each jaw; snout long, truncated, and very moveable; eyes small; ears of moderate size, pointed; body covered with bristles more or less coarse; feet four-toed, the front two large and hoofed, the lateral hinder ones not reaching the ground; in some species there is only a single hind toe, and that on the inner side; tail short; teats ten.



Head of Tapir.



Boar's Head.

EPROBOSCIFERA.—DESCRIPTION OF THE SPECIES.

RHINOCEROS. The animals forming this genus are of heavy proportions, and two of them are next in size to the Elephant. Their neck is very short, and the body stands higher on the limbs than in either Elephant or Hippopotamus, although the belly is large and pendent; the tail is short, and not reaching so low even as the hocks. The skin is very thick and tough, resembling that of the Elephant, and sparingly covered with hair. The head is small in proportion to the animal's size, and of a triangular form. The aperture of the mouth small, and the upper lip pendent, terminating in a point, and very moveable, so as to render it a prehensile organ, which the animal employs in cropping the branches of trees or shrubs.

The most remarkable character, however, of this genus is the horn or horns upon its nose; they are not deciduous, nor have they any bony core, but are supported merely upon a projecting knob or process of the nose bones, which is received into a corresponding hollow at the base of the

horn. Its structure consists of coarse hairs matted together with horny substance; these coarse hairs are placed parallel to each other; their extreme points on the lower half, and especially on the hind part of the front horn and on the greater part of the hind one, project in many places, rendering the surface irregular, and in some parts giving it a rough feel like that of a brush; the upper part of the horn, on the contrary, is smooth and plain like that of Oxen. The length of the horn varies in different species; where there are two the anterior is always the longer.

This genus is found only in very warm climates in the old world, and not unfrequently where Elephants are met with. They prefer marshy districts, probably on account of the toughness of their hide, and are fond of wallowing in the mire like Pigs. They feed on the leaves and branches of trees.

These animals are divided into two sections: 1. Those with one horn; and, 2, those with two horns.

The *Indian Rhinoceros* (*R. Indicus*), also called the Unicorn. This animal is nine feet six inches in length, and four feet eight inches in height, and its general colour is deep grey tinged with violet. It lives in shady forests in the neighbourhood of rivers and marshy places. It grunts like a Hog; and after nine months' gestation brings one young at a birth, which is about three feet in length, and has a callosity indicating the situation of the future horn. Its flesh is eaten, and every part is esteemed medicinal; the horn especially is in great repute as an antidote against poison, and cups made of it are considered to possess the same virtues. (Plate 16.)

The Javanese Rhinoceros is another species.

Of the second class, the *African Rhinoceros* (*R. Africanus*) is a specimen. It is about eleven feet and six inches long, and seven feet high. It is distinguished from the Indian species by the absence of incisive teeth; by its second horn, which is of small size, conical, and compressed; and by its skin not having any folds. It is a native of Africa, and was formerly found in the neighbourhood of the Cape of Good Hope, but, as civilization has advanced, it has retired into more sequestered districts.

Mr. Cumming thus describes the four species found in South Africa:—“Of the Rhinoceros there are four varieties in South Africa, distinguished by the Bechuanas by the names of the *Boréle* or *Black Rhinoceros*, the *Keitloa* or two-horned *Black Rhinoceros*, the *Muchocho* or *Common White Rhinoceros*, and the *Kobaoba* or *Long-horned White Rhinoceros*. Both varieties of the Black Rhinoceros are extremely fierce and dangerous, and rush headlong and unprovoked at any object which attracts their attention. They never attain much fat, and their flesh is tough, and not much esteemed by the Bechuanas. Their food consists almost entirely of the thorny branches of the wait-a-bit thorns. Their horns are much shorter than those of the other varieties, seldom exceeding eighteen inches in length. They are finely polished with constant rubbing against the trees. The skull is remarkably formed, its most striking feature being the tremendous thick ossification in which it ends above the nostrils. It is on this mass that the horn is supported. The Black Rhinoceros is subject to paroxysms of unprovoked fury, often ploughing up the ground for several yards with its horn, and assaulting large bushes in the most violent manner. On these bushes they work for hours with their horns, at the same time snorting and blowing loudly, nor do they leave them in general until they have broken them into pieces. All the four varieties delight to roll and wallow in mud, with which their rugged hides are generally encrusted. Both varieties of the Black Rhinoceros are much smaller and more active than the White, and are so swift that a horse with a rider on his back can rarely overtake them. The two varieties of the White Rhinoceros are so similar in habits, that the description of one will serve for both; the principal difference consisting in the length and set of the anterior horn; that of the *Muchocho* averaging from two to three feet in length, and pointing backwards; while the horn of the *Kobaoba* often exceeds four feet in length, and inclines forward from the nose at an angle of 45°. The posterior horn of either species seldom exceed six or seven inches in length. The *Kobaoba* is the rarer of the two, and it is found very far in the interior, chiefly to the eastward of the Limpopo. Its horns are very valuable for loading-rods,

supplying a substance at once suitable for a sporting implement and excellent for the purpose. Both these varieties of Rhinoceros attain an enormous size, being the animals next in magnitude to the Elephant. They feed solely on grass, carry much fat, and their flesh is excellent, being preferable to beef. They are of a much milder and more inoffensive disposition than the Black Rhinoceros, rarely charging their pursuer."

Mr. Cumming had many close interviews with those animals; one instance of which he thus records:—"In the evening of the 28th I shot an old bull Koodoo. At night I watched the water near my camp with Kleinboy. After a long time had elapsed an enormous old bull Muchocho, or White Rhinoceros, came slowly on, and commenced drinking within fifteen yards of us, and next minute a large herd of zebras and blue wildebeest. It was long before the Muchocho would turn his side; when he did, we fired together, and away he went with zebras and wildebeests concealed in a cloud of dust. Next came an old bull Borèlé; we fired together, and he made off, blowing loudly, after charging round and round, seeking some object on which to wreak his vengeance. Next came another Borèlé, and he got two bullets into his person. The fourth that came was another old bull Muchocho; he ran forty yards and fell. And fifth came a cow Borèlé; she fell dead to the shots. Three other Rhinoceroses came about me, but I was too drowsy to watch any longer, and fell asleep."

TAPIRUS. The animals forming this genus have some resemblance to the Rhinoceros, at least in the thickness of their hide, which is often from two-thirds to three-fourths of an inch thick; but in their general form, except in standing higher on the legs, they are more akin to the hog kind, from which, however, they are distinguished by the small size of their cuspid teeth, which do not show like the projecting tusks of the boar; by the hair in some species forming a sort of mane, which extends from the forehead to the withers; but principally by the development of the upper lip and muzzle into a kind of short proboscis or trunk. This trunk though unsuited for performing the delicate offices to which the Elephant's trunk is so well adapted, is nevertheless of sufficient length to assist in gathering towards its mouth, as the reaper's arm does the corn towards the sickle, the vegetable food upon which principally it feeds. The Tapirs are shy, retired animals, living in the marshy parts of deep forests, from which they sally out at night, or during the earlier part of the day, in search of food. They feed principally upon fruit, sugar-canes, and on the buds and shoots of trees; but even when at large they are very voracious and feed indiscriminately upon whatever they meet with.

The *American Tapir* (*T. Americanus*) is about six feet in length from the tip of the trunk to the origin of the tail, and three feet eight inches high to the top of the shoulder. The female is larger than the male, and has often so much white hair as to give her a light roan colour; and in the Cayenne species she has not any mane, which, however, is distinct enough in the Brazilian. They feed on vegetables, and do great injury to the sugar plantations especially; several of them sallying forth together, or at least a whole family, as the young follow their dam for a long time. When anticipating danger they herd together, and although usually harmless, they become so fierce and bold that they seize hold of their enemy with their teeth and pull him down so as to tear him more easily. The inhabitants along the eastern coast of Brazil make use of the Tapir's flesh for food, which very much resembles pork. (Plate 16.)

Other species—the *Mountain Tapir* and the *Malay Tapir*.

HIPPOPOTAMUS—River Horse. Of this genus there is known but one living species (*H. Amphibius*), the size of which is equal, if not superior, to that of the Rhinoceros. The Hippopotamus has a very heavy, unwieldy form, the body being large and round, with the belly nearly touching the ground on account of the shortness of the legs, which are very thick, and terminated by large feet. The mouth is of great width, and the lips thick and broad, especially the upper; they are beset with stiff, short bristles. The teeth of the Hippopotamus are of a very close texture, and extremely white, and on this account are preferred to ivory by the dentists in the manufacture of artificial teeth. The colour of the Hippopotamus when it leaves the water is mouse colour, but when the animal

has become dry, the general colour is brownish black, a little lighter on the belly.

The Hippopotamus, when undisturbed, is a mild and gentle animal, extremely cautious and shy, and when ashore very timid, but in the water is a dangerous antagonist, more especially at pairing time, when he becomes very savage, and occasionally destroys passengers who have accidentally come upon him in crossing the fords.

The Hippopotamus is found only in Africa, and probably extended formerly over the whole of that continent, excepting those countries situate to the north-west of Mount Atlas; it is most common in Southern Africa, but even here is gradually being destroyed as civilization advances northward. In Lower Egypt, where it formerly existed, it is not now found, but only in Upper Egypt—nor is it very numerous here.

SUS—Swine. The animals forming this genus are repulsive, from their habitual disposition to wallowing in dirt and filth of all kinds, from their morose and often ferocious temper, and from their unsightly form and gait. Yet swine serve a most important purpose in the general economy of nature, devouring the refuse which other animals will not touch, and converting it into useful and valuable articles of food, and other purposes. Not, however, that it feeds indiscriminately, for where it has opportunity, it as readily selects those eatables which are more suitable to it as other animals. The author of the "*Pan Suecicus*" has in the "*Amœnitates Academicæ*" of Linnæus proved this beyond contradiction, from a careful observation of the different kinds of vegetable food chosen or rejected by different domestic animals; for he found that, whilst the Ox eats 276 and rejects 218, the Sheep eats 387 and rejects 141, the Goat 449 and rejects 126, and the Horse 262 and rejects 212, the Hog eats 72 and refuses 171 plants. The females are usually very prolific, and litter once or twice a year, bringing from six to ten pigs at a farrow, to which they are strongly attached, and defend with as much courage as the male.

Swine are arranged into three sections, Hogs, Babyroussas, and Peccaries.

The first class embraces the *Common Hog* (*S. Scrofa*), from which have sprung five varieties:—The *Hog* (*S. Domesticus*), of which there are several breeds; the *Turkish Swine* (*S. Tursica*); the *Chinese Pig* (*S. Simensis*); the *Guinea Hog* (*S. Porcus*); and the *Single-toed Pig* (*S. Monongulus*).

The second class includes the genus *Barbarussa*, and the third the *Peccaries*.

The genus **PHACOCERUS** (Gr. *φακός*, a wart, and *χοῖρος*, swine), is of the family *Setigera*. These animals, commonly named *Engalla*, have great resemblance to swine, but are more thick-set and clumsy in their make. Their snout is extremely broad and flat, and their eyes so close to each other that they can only see directly forwards; these, together with the wattle-like processes depending from the lower edge of the orbits of one species, give them a very ferocious aspect. Whilst young they are lively and good tempered, but as they arrive at their full age they become savage and prefer solitude. They are natives of Africa and feed on vegetable substances, grubbing up the earth in search of roots like Pigs.

Of the family *Lamnungia* we have two genera: *Lipura* (Gr. *λειπούρος*, wanting a tail), the existence of which is not yet established, and *Hyrax* (Gr. *ἦρ* or *σῦρ*, a pig), which seems to connect the clawed with the hoofed animals, the structure of its molar teeth resembling that of the Rhinoceros in miniature, and its plantigrade motion and general form with the *Cavia*. There appears to be but one species (*H. Setosus*), the *Rock Badger of the Cape*; *Bristly Daman* or *Daman Israel*. They are about seventeen inches in length, are found in Abyssinia and Egypt, and are used as food by the Arabs of Mount Libanus and Arabia Petraea. Mr. Bruce is probably correct in his opinion that this is the animal mentioned in Psalm civ. 18, and in Proverbs, xxx. 26, under the name of Conies.

Of the family **NASUTA** there is one extinct genus—the *Paleotherium* (Gr. *παλαιόν*, ancient, and *θηρίον*, a beast), five species of which are enumerated by Cuvier, varying from the size of a hare to that of a horse.

Family—SINGLE-TOED; *Solipeda*.

So called because they have but one external toe—an undivided hoof; within the hoof, however, and beneath the skin, two toes are represented.

ILLUSTRATIVE EXAMPLES.

PLATE 17.		
Genus.	Species.	Common Name.
Equus	Caballus	Horse.
	Asinus	Ass.
	Zebra	Zebra.

CHARACTERS OF THE GENERA.

EQUUS. In each jaw six incisive teeth with flat crowns; cuspid teeth small, conical, and standing apart by themselves in a gap between the incisive and molar teeth, sometimes wanting in the upper jaw of the female; molar teeth twelve in each jaw, six on a side; body covered with hair, mane generally flowing; feet single-toed, and covered with an undivided hoof; teats inguinal.

SOLIPEDA.—DESCRIPTION OF THE SPECIES.

In this genus are found two animals, the Horse and Ass, which from the earliest periods have been domesticated by man, serve to the important purposes of carriage and draught during life, and after death afford their hair, skin, and hoofs, as articles of commerce.

They are vegetable feeders, and repay, by the improvement in their breed and value, the pains which are bestowed upon them. They go with young eleven months, and bring forth one young one at a time, which is called a Foal.

The *Horse* in its wildest state is found about the Lake Aral, near Kuzneck; on the river Tom in the southern parts of Siberia; in the Mongolian Deserts; and in the Kalkas, north-west of China. They live in herds, and are extremely shy and vigilant, always having a sentinel on the look-out whilst they feed, and upon the least alarm rushing off with great rapidity. They are hunted by the Kalmucks on horseback; and for the purpose of arresting their speed these people are accustomed to fly hawks at them, which fastening themselves upon the Horse, annoy him, and his attention being diverted, in his attempts to free himself, his speed is diminished, and he is soon overtaken by his pursuer.

Horses are not found within the Arctic circle, but they exist as high as Norway and Iceland, where they are small and of a peculiar variety. In South America they are found wild in large herds; these are not, however, considered indigenous, but as the offspring of the horses introduced by the Spaniards in their early visits to that continent.

In Arabia, Horses are found in the highest perfection, as if it were to compensate for the attention and kindness with which they are treated. To the Arab, his Horse is as dear as his children: with them it shares his tent, and is equally the object of his solicitude. During the day the Horses are usually saddled, and at the tent door; but at night they rest under the same covering, and amidst the family of their master: they are never beaten or spurred, and are directed in their course merely by a slight switch.

The Horses most commonly used in this country for agricultural purposes are the Cleveland Bay and the Suffolk Punch. The black Cart Horse is also in common use, but from its unwieldy size is incapable of doing so much work as smaller and more compact Horses.

Our engraving contains a fine figure of the *Equus Cabullus*—the Generous Horse of Pennant; also one of the *Ass* (*Equus Asinus*).

The *Wild Ass* (*Onager*) of the ancients, and Koulan of the Tartars, is the stock whence proceeds our domestic Ass. In the autumn they migrate from Tartary into the warmer climates of Persia and India, where they pass the winter, and afterwards return to their original habitation. They are very shy and of great speed. They are hunted by the Tartars for the sake of their flesh, which is by them much esteemed. Our domestic Ass, however, has a dull, heavy look, his head stooping; his ears slouching; the mane short; the body covered with rough, ash-coloured hair; the tail naked and furnished only with a long tuft at its tip; and the

shoulders marked with a black stripe. Despised and abused as he too frequently is in this country, the Ass has a very different appearance wherever he is well groomed and looked after; in proof of which many examples might be given.

The Ass is patient under ill usage, and persevering in labour; indifferent with respect to food, being contented with a thistle, or any other vegetable it may meet with, but rather preferring plantain, for which it has been observed to neglect every other herb in the pasture.

The *Zebra* rather resembles the Ass than the Horse (Plate 17), particularly in the shortness of the neck, the greater length of the head and ears, and the extremity of the tail being alone furnished with hairs. But the Zebra is remarkably distinguished from each of those animals by a kind of dewlap or loose skin, which depends from the throat.

The Zebra is a beautiful animal: the ground colour of the coat is of a yellowish white, and the muzzle brownish black; the stripes on the forehead and mouth are reddish. Eight black stripes mark the neck, and twelve the trunk, of which the last two or three join obliquely at the lower part, to harmonise with the horizontal stripes on the thighs and legs, and a similar disposition in front is observed near the lower part of the shoulder. The cry of the Zebra is very peculiar, and by some said to resemble a post horn; it more frequently exerts it when alone than in company. Several have been brought to England, but although commonly submissive to their keeper, on the slightest irritation they will bite and kick with great violence.

ORDER VIII.—RUMINANTIA. CUDCHEWERS.

THE animals belonging to this order are characterised by the faculty they possess of returning the food, which they had recently swallowed, again to their mouth, for a second and a thorough mastication. During this process the animal is at rest. The Ruminant Animals are the most useful to man.

Family—CAMEL-LIKE; *Cameloida*.

This family includes the Camels proper, the Llama, and the Musk; the first species resembles the *Pachydermata* more than the others; while the Musk differs but little from the ordinary Ruminantia.

ILLUSTRATIVE EXAMPLES.

PLATE 18.		
Genera.	Species.	Common Name.
Camellus	Dromedarius	Dromedary.
Auchenia	Llama	Llama.
Moschus	Javanicus	Java Musk.

CHARACTERS OF THE GENERA.

1. CAMELUS (Gr. *καμήλος*, from Heb. *לָמָד*, a Camel). Upper lip divided, incisor teeth in the lower jaw; cuspidate in one or both jaws, and eighteen or twenty molar teeth; the scaphoid and cuboid bones of the tarsus distinct; two toes, each bearing a claw or nail; callosities on the knees and chest; stomach provided with a curious contrivance for holding water.

2. AUCHENIA. A genus, according to Illiger, but a subgenus of Camelus, according to Cuvier: see article CAMELUS.

3. MOSCHUS (Gr. *μοσχός*, a Musk). No incisive teeth in the upper, but eight in the lower jaw; in the upper jaw of the male two long cuspid teeth extending far beyond the lips, curved backwards, and either rounded or flattened on the outer surface; none in the female; molar six on each side in either jaw with tubercular crowns, the first in the upper, and the first two in the lower jaw, provided with cutting edges and points; nose long and narrow; tail short, in some little more than a tubercle.

CAMELOIDA.—DESCRIPTION OF THE SPECIES.

CAMELUS—the *Camel*. There is scarcely a single genus in the whole animal creation more interesting and useful than that now under considera-

tion. It appears to form a connecting link between the *Pachydermata* and the *Ruminantia*. The muzzle is long, and the bones of the face, particularly at the fore part, very much flattened; the upper lip divided. The neck is long and slender, and is generally carried in a double curved direction, like the italic *f* reversed. The back bears one or two, or no hunches, which has given occasion to Illiger to divide the genus into two—*Camelus*, or those which have one or two hunches, and *Auchenia*, which have them not: this, however, is a matter of little consequence, as they resemble each other in their great peculiarities.

Camels are harmless, inoffensive, and patient of fatigue and hunger; they serve for beasts of burthen in the East; of their milk cheese is made, and their wool furnishes many other parts of the Arabian economy; their flesh is also occasionally eaten. The Camel and Dromedary are natives of the old, whilst the other species are only found in the new world.

Cuvier has divided them into subgenera, the Camels and the Llamas, the latter of which are the *Auchenia* of Illiger.

The Camels, or those which have one or two hunches, include—

The *One-hunched Camel* (*C. Dromedarius*), commonly called the *Dromedary*; it has but a single hunch, which rises nearly in the middle of the back; it is a native of Africa and Asia, and is used commonly as a beast of burthen in Egypt and Arabia: the African Dromedaries are the most hardy, those of Arabia the swiftest. The common sort travel about thirty or forty miles a day, and they will carry a burthen of 1,000 or 1,200 pounds weight. Whilst being loaded they are accustomed to lie down, and if there be put upon them more than they can bear, they will not rise till part be taken off. They are also used for the saddle, but are rough trotters. (Plate 18.)

The *Bactrian Camel* (*C. Bactrianus*) very much resembles the preceding, except in having two hunches on his back; one of which is just above the shoulders, and the other on the loins: he stands about the same height as the Dromedary, and is made use of for similar purposes.

Those without hunches (the *Auchenia* of Illiger) are the Llamas of the new world (Plate 18). Cuvier states that the toes are not united by membranes, as in the former species, but this is not correct. The *Llama* (*C. Llama*) is about the size of a Stag, with a long shaggy coat of a reddish-grey colour; the back is straight, having no hunch. The neck is much bent, and in rather an elegant form; and the animal does not carry the head in the awkward manner of the Camel.

This is the most important beast of burthen in the South American continent, and was the only one known to the natives previously to the arrival of the Spaniards. They carry burthens to the weight of 100 to 150 pounds. They are docile, but move with great gravity when domesticated, and no blows can force them to change their pace. If fatigued they immediately lie down, and will not again move until rested, in spite of every effort to impel them forwards. When angry, they eject their saliva on the offender, even to the distance of ten paces. In the wild state they associate in large herds, and, while feeding, one keeps watch on some high pinnacle; on perceiving the approach of any one he neighs, and the whole herd gallops off with great swiftness.

The species *C. Vicugna* is about the size of a Sheep, covered with a long and very fine wool, of a dull purple colour; the belly white; shaped much like the former, but much smaller.

Moschus—the *Musk*. The animals which form this genus are all natives of the East, and derive their name from the circumstance of one of them furnishing the perfume musk, which is contained in a bag in the abdominal region. They are timid animals, and extremely nimble.

The *Thibet Musk* (*M. Moschiferus*) is about three feet three inches in length; two feet three to the top of the shoulder, and two feet nine to the top of the hunch in height; hair thick and crisp, of various colours, but principally brown; tail a mere tubercle. They inhabit the kingdom of Thibet, the province of Mohang Meng in China, Tonquin, and Bontan; also about the Lake Bachal, near the Rivers Jenessea and Argun. They are naturally very shy, love solitude, and live on mountains most wild and difficult of access. They are hunted, an occupation of great danger, for the

sake of their musk; the bag containing which the hunters cut off, and tie up for sale.

The *Meminna* species, about seventeen inches long, is found in Ceylon.

The *Napu Musk* (*M. Javanicus*) is about twenty inches long and thirteen high, but is much higher behind than at the shoulder; the top of the head very flat; the general colour is mottled-ferruginous; the tail two or three inches long, and white beneath. It is called *Napu* by the natives, is found among the thickets on the sea-shore, and feeds principally on the berries of a species of *Ardisia*; and, if taken young, can be easily tamed. (Pl. 18.)

The *Kanchil Musk* cannot be tamed; it is so alert and cunning as to have given rise to the Malay proverb for a rogue, "as cunning as a Kanchil." When caught in the nooses laid for them they feign death, but the moment they are incautiously untied they start off and escape.

Family—SOLID-HORNED; *Solidicornia*.

The Stags (*Cervus*) and the Giraffes (*Camelopardalis*) constitute this family.

ILLUSTRATIVE EXAMPLES.

PLATE 19.		
Genera.	Species.	Common Name.
<i>Cervus</i> - - - -	{ <i>Alces</i> - - -	Elk or Deer.
	{ <i>Tarandus</i> - - -	Rein-deer.
	{ <i>Capreolus</i> - - -	Roebuck.
<i>Camelopardalis</i> - - -	<i>Giraffa</i> - - -	Giraffe or Camelopard.

CHARACTERS OF THE GENERA.

1. **CERVUS** (*Gr. κέρας, a horn*). Antlers solid, deciduous, and not having any horny covering; entirely wanting in the female, except in one species; tear-pits; feet bisulcated or cloven.

2. **CAMELOPARDALIS** (*Lat. Camelus, a Camel, and Pardus, a Panther*). Horns short, slightly conical, not deciduous, covered with a velvet-like skin, and tufted at the superior extremities; bony tubercle between and below the eyes; neck very long and taper.

SOLIDICORNIA.—DESCRIPTION OF THE SPECIES.

CERVUS—*Deer*. This genus of animals is the only one of the order *Ruminantia* which possess deciduous horns, or antlers, as they should be properly called, since they are mere bony processes, without any horny covering at all; in which respect they resemble the *Camelopardalis*, but differ from it in dropping the antlers yearly, whilst in the Camelopard they are never changed. The growth of the antlers begins early in the spring, and they rise from the forehead of the animal at first covered by the skin; through this, however, the antler soon bursts, and it forms a kind of ring at the root, which is called the *bur* of the horn; it continues to grow, and as long as the growth continues, the horn or antler is covered with a kind of cuticle resembling velvet, which adheres firmly to it; but, as soon as the horn ceases to grow, the velvet separates, and is rubbed off, and the antler is then said to be burnished. When the horn is completely formed, the rutting season commences. The horn is generally shed between January and March. The animals composing this genus are graminivorous, living on herbage and the young shoots of trees; they are very timid, except during rutting time, when they become very fierce and quarrelsome, attacking one another, and even persons who may chance to come in their way. They seldom produce more than one young one, which is called a *Fawn*. The female of this genus is named the *Hind*.

Deer are divided into three sections: 1, those with horns partially or entirely flat; 2, those with rounded horns; and 3, those with small horns.

The *Moose Deer*, or *Elk* (*C. Alces*), native of the forests of Europe, Asia, and America, belongs to the first section (Plate 19). It is about the size of a horse, and sometimes larger; its shape is much less elegant than the rest of the Deer tribe; its neck short and thick, and furnished with a kind of dewlap; head large, the upper lip very thick and broad;

horns sometimes measuring as much as thirty-two inches in length; shoulders high, and legs very long; the hair stiff and coarse, and of a dark-greyish brown; eyes and ears large; hoofs broad; tail short. The female has no horns. The Elk frequents the margins of rivers and lakes during summer-time, and gets into the water to avoid the innumerable multitude of flies and mosquitoes which torment it. It is more easily tamed than any other kind of Deer, and will follow their keeper at his call without trouble.

The *Rein Deer* (*C. Tarandus*) is about the size of our Stags, but shorter and thicker in the leg; the horns of both male and female are divided into many branches; at first these are thin and pointed, but, as the animal increases in age, they become palmated and denticulated; the hair on the body is of a dark-brown colour; on the neck, brown mixed with white. It is a dull-looking animal, and inhabits the frozen regions of Europe and Asia. (Plate 19.)

The Rein Deer presents one of the most interesting proofs of the goodness of Providence towards his creatures: without it, the poor Laplander would be almost at a loss for food and raiment; but, possessing his Rein Deer, he wants neither horse, nor sheep, nor oxen. At three or four years old they are trained to labour, and continue serviceable four or five years, at which time they are killed. The flesh of the Rein Deer serves for food during the whole winter, and the tongues, considered a dainty, are sold even into other countries. From the sinews are made thread, and, when covered with hair, these are employed as ropes. From the skins are prepared clothes, which are warm, and suited to the severity of the climate; they serve also for beds when spread on the leaves of trees.

Of course, as the Rein Deer constitutes almost the sole riches of the Laplander, constant attention to its preservation and security is his principal employment; each person possesses a flock or flocks of Rein Deer, and it is not uncommon for one person to have five hundred in a single herd. Every morning and evening during summer, the herdsman fetches his Deer to be milked at his cottage, and this is filled with smoke, for the purpose of driving away his tormentor, the gad-fly, and keeping the animal quiet during milking-time. The female gives about a pint of milk daily, which is thinner than that of the cow, but sweeter and more nourishing.

The female breeds at two years, is in season towards the latter end of September, goes with young eight months, and generally brings two at a time, which follow her for two or three years.

The *Fallow Deer* (*C. Dama*) is less than the Stag; it is found in all Europe, especially in England.

The *Red Deer* or *Stag* (*C. Elaphus*) comes under the second section. Its antlers are long, upright, and much branched, with slender brow antlers; colour generally of a reddish brown. It is common in Europe, the north of Asia, Barbary, and North America, and is still found wild in the Highlands of Scotland. It begins to shed its antlers in February or March, and recovers them completely in July. It is very furious and dangerous during the rutting season, which is in August.

The *American Elk*, *Virginian Deer*, and *Spotted Axis* (found in Ceylon), are species of this section.

In the third section we find the *Mexican Deer*; the *Porcine Deer*, native of Borneo, &c.; the *Rib-faced Stag*, from Ceylon and Java; the *Tailless Roe*, of Siberia; and the *Roe Buck* (*C. Capreolus*), figured on Plate 19, native of Europe. The Roe Buck is not so large as the Fallow Deer; antlers upright, rugged, and trifurcated; from six to eight inches in length; hair in summer very short and smooth; ends of the hair red, roots grey. It lives in pairs in the forests. The flesh is considered better than that of the Stag.

CAMELOPARD. The only known species of this remarkable genus is the *Camelopard* (*C. Giraffa*), which is usually about sixteen or seventeen feet in height to the top of the forehead. The body of the animal is short in comparison with its extremities, not being longer from the front of the chest to the back of the hind quarter than two-thirds of their length, which in the male is about eight feet to the junction of the shoulder-bone with the scapula. The hinder legs, though at first apparently much shorter

than the fore legs, are not much so, if at all; and this appearance is produced in consequence of the great length of the withers or spinous processes of the dorsal vertebrae, about six or seven feet in length. The chest is rather prominent, and above it rises a long and taper neck, which is surmounted with a small head, not larger than that of a thorough-bred Horse, and in shape resembling that of the Deer. On the head are two short horns, which are not deciduous, and seem to be processes of the frontal bone, covered with a fine velvet-like skin, and terminating at their extremities in short tufts of hair, which, as well as the covering of the horn, are of a dark-brown or black colour. The tail is about three or four feet in length, and furnished with a tuft of long loose dark-brown hair, which reaches below the hock. The hoofs are bisulcate. The general colour of the animal is a rufous brown. (Plate 19.)

This animal is a native of Africa. Our oft-quoted author, Mr. Gordon Cumming, has the following graphic account of this animal:—

“These gigantic and exquisitely-beautiful animals, which are admirably formed by nature to adorn the fair forests that clothe the boundless plains of the interior, are widely distributed throughout the interior of Southern Africa, but are nowhere to be met with in great numbers. In countries unmolested by the intrusive foot of man, the Giraffe is found generally in herds varying from twelve to sixteen; but I have not unfrequently met with herds containing thirty individuals, and on one occasion I counted forty together; this, however, was owing to chance, and about sixteen may be reckoned as the average number of a herd. These herds are composed of Giraffes of various sizes, from the young Giraffe of nine or ten feet in height, to the dark chestnut-coloured old bull of the herd, whose exalted head towers above his companions, generally attaining to a height of upwards of eighteen feet. The females are of lower stature, and more delicately formed than the males, their height averaging from sixteen to seventeen feet. Some writers have discovered ugliness and a want of grace in the Giraffe, but I consider that he is one of the most strikingly-beautiful animals in the creation; and when a herd of them is seen scattered through a grove of the picturesque parasol-topped acacias which adorn their native plains, and on whose uppermost shoots they are enabled to browse by the colossal height with which nature has so admirably endowed them, he must indeed be slow of conception who fails to discover both grace and dignity in all their movements.”

Family—HOLLOW-HORNED; *Cavicornia*.

This family is far more extensive than the preceding; the diversities existing in the form of the horn have suggested the classification of several species.

ILLUSTRATIVE EXAMPLES.

PLATE 20.

Genera.	Species.	Common Name.
Antelope	Cervicapra	Common Antelope.
	Oryx	Ægyptian Antelope.
	Pygmæa	Royal Antelope.
	Picta	White-footed Antelope.
	Gnu	Gau.

PLATE 21.

Capra	Ibex	Ibex Goat.
Ovis	Ammon	Wild Sheep.
	Montana	Rocky Mountain Sheep.
Bos	Americanus	Bison.

CHARACTERS OF THE GENERA.

1. **ANTILOPE** (derivation uncertain; it is supposed to be a corruption of *ἀνταλόπος* or *ἀντολόπο*, a word used by Eustathius to signify an animal which had the horns long, and notched as if with a saw). Horns hollow, supported on solid bony processes, curved, annulated, and not deciduous; eight broad incisor teeth in the lower jaw, but none in the upper; the inside of the ears marked lengthways with three feathered lines of hair; limbs light and elegant.

2. *CAPRA* (Lat. *carpo*, I crop). Horns bending upwards and backwards, almost close at their base; chin generally furnished with a long beard.

3. *OVIS* (Lat. *ovis*, Sheep). Incisive teeth eight in the lower jaw, forming a perfect arc, and touching each other by their sides, none in the upper; molar six on each side in each jaw; forehead more or less arched; horns large, angular, furrowed transversely, spirally twisted, and turning outwards; no tear-pits or beard; legs slender; tail variable in length, pendulous.

4. *Bos* (Gr. *βοῦς*, an Ox). Horns bending out laterally, and forwards, upwards or downwards; muzzle large; no upper incisor nor any canine teeth; skin of the neck pendulous; limbs large and unwieldy.

CAVICORNIA.—DESCRIPTION OF THE SPECIES.

ANTILOPE. This genus forms, in the opinion of Pennant, "an intermediate genus, a link between the Goat and Deer; agreeing with the former in the texture of their horns, which have a core in them, and are never cast; and with the latter in elegance of form and swiftness." They form a very large genus.

They live in large herds of two or three thousand, or in small parties of five or six, and generally in hilly countries, browsing like goats, and living on the tender shoots of trees. They are elegantly formed, active, restless, shy, and uncommonly swift, running with vast bounds, and leaping with surprising agility. The chase of them is a favourite diversion in the east, where they are not only hunted with the greyhound and hunting leopard, but also with the falcon, which is trained for that purpose. The pursuit of the Chamois, which belongs to this genus, is a favourite diversion of the Swiss; and the fatigue and dangers they undergo in that chase are well known.

The horns of the Antelope genus are composed of solid bony processes attached to the os frontis, similar to those of the deer kind, but covered with horn, and not deciduous: in other respects they are similar to that genus; generally, though not always, having the lachrymal fossæ, or tear-pits.

They have been divided into sections from the form of their horns, both by Pennant and Cuvier: the division of the latter is adopted here.

1. Horns annulated, having a double or triple curve, and pointing forwards, downwards, or upwards.

Under this division we find the following: the *Common Antelope* (*A. Cervicapra*), represented on Plate 20. This animal is rather smaller than a fallow deer; the horns, about sixteen inches long, are black, distinctly annulated, and have three curves. The animal is of a reddish brown above, and white below; around the orbits of the eyes is white, which is continued into a white patch on either side of the forehead; the muzzle is black. The female is known by having no horns, and by a white stripe on the flanks.

The *Barbary Antelope* (*A. Dorcas*), which measures about three feet nine inches from nose to tail, and two feet four inches high. "The fleetness of the Antelope," says Pennant, "was proverbial in the country it inhabited, even in the earliest times: the speed of Asahel (2 Sam. ii. 18) is beautifully compared to the Tzebi; and the Gadites were said to be as swift as the Antelopes (translated 'roes') upon the mountains. The sacred writers took their similes from such objects as were before the eyes of the people to whom they were addressed. There is another instance drawn from the same subject. The disciple raised to life at Joppa was supposed to have been called Tabitha, or Dorcas, from the beauty of her eyes; and to this day, one of the highest compliments that can be paid to female beauty in the eastern region is *Aine el Gazel*, You have the eyes of an Antelope."

The *Flat-horned Antelope* (*A. Kevella*), similar in form to the above; the *White-faced Antelope* (*A. Pygarga*), larger than the preceding; the *Yellow Goat* of the Chinese (*A. Gutturosa*), as large as the stag; the *Scythian Antelope* (*A. Sâiga*); the *Senegal Antelope* (*A. Senegalensis*); the *Gambian Antelope* (*A. Lerwia*); and the *Springbok* (*A. Euechore*).

"The Springbok of the Cape," says Mr. Gordon Cumming, "is so termed

by the colonists on account of its peculiar habit of springing or taking extraordinary bounds, rising to an incredible height in the air when pursued. The extraordinary manner in which Springboks are capable of springing is best seen when they are chased by a dog. On these occasions away start the herd, with a succession of strange perpendicular bounds, rising with curved loins high into the air, and at the same time elevating the snowy folds of long white hair on their haunches and along their back, which imparts to them a peculiar fairy-like appearance, different from any other animal. They bound to the height of ten or twelve feet, with the elasticity of an India-rubber ball, clearing at each spring from twelve to fifteen feet of ground, without apparently the slightest exertion. In performing the spring, they appear for an instant as if suspended in the air, when down come all four feet again together, and, striking the plain, away they soar again as if about to take flight. The herd only adopt this motion for a few hundred yards, when they subside into a light elastic trot, arching their graceful necks and lowering their noses to the ground, as if in sportive mood. Presently pulling up, they face about, and reconnoitre the object of their alarm. In crossing any path or waggon-road on which men have lately trod, the Springbok invariably clears it by a single surprising bound; and when a herd of perhaps many thousands have to cross a track of the sort, it is extremely beautiful to see how each Antelope performs this feat, so suspicious are they of the ground on which their enemy, man, has trodden. They bound in a similar manner when passing to leeward of a lion, or any other animal of which they entertain an instinctive dread.

"The accumulated masses of living creatures which the Springboks exhibit on the greater migrations is utterly astounding, and any traveller witnessing it as I have, and giving a true description of what he has seen, can hardly expect to be believed, so marvellous is the scene.

"They have been well and truly compared to the wasting swarms of locusts, so familiar to the traveller in this land of wonders. Like them, they consume every green thing in their course, laying waste vast districts in a few hours, and ruining in a single night the fruits of the farmer's toil. The course adopted by the Antelopes is generally such as to bring them back to their own country by a route different from that by which they set out. Thus their line of march sometimes forms something like a vast oval, or an extensive square, of which the diameter may be some hundred miles, and the time occupied in this migration may vary from six months to a year."

2. Horns annulated, having a double curve, differing in direction from the preceding section, and having the points turned backwards.

Species—the *Cervine Antelope*, the Haute-beest of the Dutch (*A. Babalis*), larger and more clumsy than the other species of Antelope, partaking of the stag and heifer, with a large head, broad thick nose, and a reddish-brown coat: is common in Barbary and Northern Africa.

The *Caama Antelope*, Cape Stag of the Dutch (*A. Caama*), is very like the preceding: common at the Cape.

3. Horns annulated and straight, or but slightly curved.

Species—the *Capra Gazella* (*A. Oryx*), called also the Egyptian Antelope, and by the Dutch the Cape Chamois (Plate 20). The Oryx is thus described by Mr. Cumming:—

"The Oryx, or Gemsbok, is about the most beautiful and remarkable of all the Antelope tribe. It is the animal which is supposed to have given rise to the fable of the Unicorn, from its long straight horns, when seen, *en profile*, so exactly covering one another as to give it the appearance of having but one. It possesses the erect mane, long sweeping black tail, and general appearance of the Horse, with the head and hoofs of an Antelope. It is robust in its form, squarely and compactly built, and very noble in its bearing. Its height is about that of an Ass, and in colour it slightly resembles that animal. The beautiful black bands which eccentrically adorn its head, giving it the appearance of wearing a stall-collar, together with the manner in which the rump and thighs are painted, impart to it a character peculiar to itself. The adult male measures 3 feet 10 inches in height at the shoulder.

"The Gemsbok was destined by nature to adorn the parched karroos

and arid deserts of South Africa, for which description of country it is admirably adapted. It thrives and attains high condition in barren regions, where it might be imagined that a locust would not find subsistence, and, burning as is the climate, it is perfectly independent of water, which, from my own observation, and the repeated reports both of the Boers and aborigines, I am convinced it never by any chance tastes. Its flesh is deservedly esteemed, and ranks next to the Eland. At certain seasons of the year they carry a great quantity of fat, at which time they can more easily be ridden into. Owing to the even nature of the ground which the Oryx frequents, its shy and suspicious disposition, and the extreme distances from water to which it must be followed, it is never stalked or driven to an ambush like other Antelopes, but is hunted on horseback, and ridden down by a long, severe, tail-on-end chase. Of several animals in South Africa which are hunted in this manner, and may be ridden into by a Horse, the Oryx is by far the swiftest and most enduring. They are widely diffused throughout the centre and western parts of Southern Africa."

The *Guinea Antelope* (A. *Grimmia*), one foot and a half high; the *Ourebi Antelope* (A. *Scoparia*), and the *Royal Antelope* (A. *Pygmaea*), are members of this section. The Royal Antelope is figured on Plate 20: it is not more than nine inches high, its horns are strong, short, sharp-pointed, and perfectly black; the female has none; its colour is a bright bay, paler beneath and on the insides of the limbs; the legs are scarcely thicker than a quill; being occasionally tipped with gold, they have been used as tobacco-stoppers. They inhabit the hottest parts of Africa, and are said to be so active as to be able to leap over a wall twelve feet high.

4. Horns annulated with a single curve, the points turned backwards.

The *Blue Goat of the Cape* (A. *Leucophæa*), larger than a Deer, and the *Equine Antelope* (A. *Equina*), about the size of a Horse, are species of this division.

5. Horns annulated, and having a single curve pointing forwards.

Species—the *Swift Antelope* (A. *Dama*), the *Red Antelope* (A. *Redunca*), the *Cinereous Antelope* (A. *Eleotragus*), and the *Roebuck of the Reeds* (A. *Arundinacea*), so named from its frequenting reedy places.

6. Horns surrounded with a spiral wreath.

Species—the *Impoof*, *Impophoo*, *Cape Elk of the Dutch*, or *Eland* (A. *Oreas*), is one of the most remarkable in this section. Pennant's description of it has been corroborated by Mr. Cumming, from whose work (vol. i. p. 253) the following is extracted:—

"This magnificent animal is by far the largest of all the Antelope tribe, exceeding a large Ox in size. It also attains an extraordinary condition, being often burthened with a very large amount of fat. Its flesh is most excellent, and is justly esteemed above all others. It has a peculiar sweetness, and is tender and fit for use the moment the animal is killed. Like the Gemsbok, the Eland is independent of water, and frequents the borders of the great Kalahari desert in herds varying from ten to a hundred. It is also generally diffused throughout all the wooded districts of the interior where I have hunted. Like other varieties of Deer and Antelope, the old males may often be found consorting together apart from the females; and a troop of these, when in full condition, may be likened to a herd of stall-fed Oxen. The Eland has less speed than any other variety of Antelope; and, by judicious riding, they may be driven to camp from a great distance. In this manner I have often ridden the best bull out of the herd, and brought him within gunshot of my waggons, where I could more conveniently cut up and preserve the flesh, without the trouble of sending men and pack-oxen to fetch it. I have repeatedly seen an Eland drop down dead at the end of a severe chase, owing to his plethoric habit. The skin of the Eland I had just shot emitted, like most other Antelopes, the most delicious perfume of trees and grass."

A fair specimen of this species may be seen in the British Museum. Mr. Adam White, in his "Popular History of Mammalia," informs us that "in 1842 the Earl of Derby had three of those animals alive in his fine menagerie, and he found that they stood this climate very well, both winter and summer, without any other protection than a shed, to which they could resort in cold weather."

The *Striped Antelope* (A. *Strepsiceros*) is a noble animal: it is as large as a Stag, is very active, and leaps in an extraordinary manner. Dr. Forster says he saw one leap ten feet high. Its spirally-twisted horns are described by Sir W. C. Harris as ponderous, yet symmetrical.

The *Spotted Goat of the Cape*, or *Harnessed Antelope* (A. *Scripta*), and the *Forest Antelope* (A. *Sylvatica*), belong to this section.

7. Horns smooth.

Species—the *White-footed Antelope* (A. *Picta*), figured on Plate 20, is four feet high to the top of the shoulder, the horns short, pointed, smooth, and of a blackish colour, bending a little forwards; the hair greyish, with a large patch of white beneath the throat; the feet, just above the hoofs, marked by two white bands in the male, and three black, with two white ones in the female; a slight mane of black hair traverses the neck, and a larger tuft of a similar colour is situated on the breast; the female has no horns, is smaller, and of a pale-brown colour. It inhabits the interior of India.

The *Hindustan Antelope* (A. *Trago-camellus*) is not so elegant in form as the other species: it resembles a Camel in many particulars. One seen by Dr. Parsons was thirteen feet high.

The *Chamois Antelope* (A. *Rupicapra*) "is the only ruminating animal of the west of Europe," says Cuvier, "which can be compared to the Antelope." It is about the size of the common Goat, of a rufous-brown colour, with the cheeks, chin, throat, and belly of a yellowish white, and a streak of black passing from the eye down to the muzzle; its horns, which are straight, have their points suddenly curved back, like a fish-hook.

This is a very timorous animal; it lives in small troops, in the middle regions of very high mountains, skipping with great activity over the steep rocks; it feeds chiefly early in the morning and evening, during which time a sentinel is on the watch, who alarms the herd by a shrill cry. The chase of them is very laborious.

Under this section the *Gnus* (Catobepias) have been placed; but Colonel Smith has separated them from the Antelopes in consequence of the differences which exist between them. Compare the figures on Plate 20.

The *Gnu* differs from the Antelope, even more than the Chamois, and at first presents to the eye a monster made up of the parts of different animals; its body and hind quarters are similar to those of a small horse, covered with brown hair; the tail is furnished with long white hairs, also like the Horse; and on the neck is a fine straight mane, which is white at the roots, but black at the edge; its head is large, and the mouth square like the Ox, the lips covered with short stiff bristles, and from the nose up the forehead runs an oblong square brush of stiff bristles; round the eyes grow several radii of strong white bristles. Both sexes are horned, and the horns of the young are said to be straight. It is a fierce and dangerous animal, living in large herds in the mountains north of the Cape.

"The Gnus and the Buffalo," says Dr. Andrew Smith, "rarely fly immediately on their discovering noises or appearances which excite their surprise or apprehension. Frequently the only result which follows the discharge of muskets is a momentary halt, a gaze, a confused rush in no given direction, and then a determined attempt to persevere in the direction they had been pursuing, even though such should carry them nearer to the position of their assailants."

CAPRA—Goat. This genus of animals is distinguished from the Sheep by its vivacity and courage, by its horns not being twisted, and by its having a long beard. Another distinction is the extremely offensive smell which the Goat emits, and which does not belong to the Sheep. It is a very useful animal, supplying food and raiment in no inconsiderable degree.

Species—the *Caucasian Goat* (C. *Ægagrus*) is larger in size than the common Goat, and is one of the animals from which the Bezoars are obtained: these were formerly considered very valuable in medicine as alexipharmics; in proof of which it may be mentioned that Tavernier sold one, weighing four ounces and a quarter, for the sum of two thousand livres.

From this species is believed to have originated several varieties, of which (1) the first is the *Common Goat* (C. *Hircus*), a native of every part of the old world; but it does not appear to have been known in America before that

continent was visited by Europeans. It is a lively, sportive, wanton animal, impatient of confinement, fond of solitude, and climbing lofty rugged eminences; it is easily tamed, and frequently kept in stables, from a notion which grooms have of the strong scent which it emits being invigorating to horses. It is of full age at a year, and the female at seven months, and it becomes old at five years.

2. The *Angora Goat*, remarkable for its hair, which curls in long ringlets of eight or nine inches in length, is of a silky texture and of a glossy silvery whiteness; it is the basis of our camlets, and is sent into this country in the form of thread.

3. The *Syrian Goat* (C. Mambrica), characterised by the great length of its ears, which hang down, and occasionally measure two feet long.

4. The *African Goat* (C. Depressa); 5, the *Whidaw Goat* (C. Reversa); and, 6, the *Capricorn Goat*, natives of Africa.

7. The *Ibex Goat* (C. Ibex), figured on Plate 21, is known by its large knotted horns, reclining backwards, and sometimes three feet long; its head is small; the eyes large; hair rough; beard dark coloured; general colour deep brown, mixed with tawny; under parts white; tail short; hoofs short. The females are smaller than the males, and their horns are smaller and have fewer knobs. It inhabits the mountainous parts of the European and Asiatic continents.

Ovis—*Sheep*. They are distinguished from the Goats by their arched forehead, by the variation in direction and greater extent of curve of the horns, and by not having any beard: beyond these there is no great distinction between the two genera. Their fur is wool; but this varies in texture according to the difference of climate, as in those which live in warm climates it becomes hairy and very fine, and from such fleeces the Cachemere shawls, formerly supposed to be manufactured of goats' hair, are made. Sheep feed on vegetables, and live in flocks of greater or less number, on high hills or on the tops of mountains. Corsica, Sardinia, and other of the Mediterranean islands, are the parts in which the species most anciently known exist, and whence it is probable our domestic Sheep are derived: others also are found on the chain of the Atlas, in the mountains of Siberia and Kamtschatka, and in America. Whilst in a state of nature they are very strong and active, leap and run with great agility, and have not the silly character they appear to bear in a state of domestication. The people of the various parts of the world in which Sheep are found derive many of the necessities of life from them. Besides affording its flesh for food and its fat for tallow, the wool in more civilized countries is manufactured into cloth, whilst the ruder Northern Asiatics wrap themselves up in skins with the wool remaining on it. After the hide is dressed it is made into leather, and by a different process into parchment. Even the intestines are brought into use, and of them is manufactured the article catgut, to which we are indebted for the melodious tones poured forth by a cremona.

The *Wild Sheep* (Ovis Ammon) is about the size of a small Deer; the horns of the male are very large and strong, measuring two ells in length; the horns of the female not so large, hatchet-shaped, nearly straight, and greatly resembling those of our Common Goat. *Argali* is the name given to this species of Sheep by the Kirgisian Tartars, probably from its frequenting mountainous districts, as in their language *Arga* signifies a mountain summit, and *Guldsha* a Ram, of which two words it seems to be compounded; and from the same cause the Kurilians call it *Rikundonotsh*, or the Upper Rein Deer; whilst the Russians designate it as the *Stepnoi-daran*, or Ram of the desert; *Kammenoi*, or Rock Ram; and *Dikoi*, or Wild Ram. It is found in the vast deserts which are called steppes, and upon the mountainous chains of Asia, especially those which extend across the plains of Tartary towards the north-east. Gmelin says that the southern part of Siberia is their original country. They are lively and active animals, and are extremely fearful of man. (Plate 21.)

The *Corsican Sheep* (O. Aries), called also the *Mouflon*, is found in the highest parts of mountainous districts, amongst the most inaccessible peaks, but always in temperate or southern latitudes. They are fierce, dull, and untamable animals. Cuvier and Buffon are of opinion that they are the stock whence the several races of our Sheep have sprung.

There are several varieties: the *Long-legged Sheep* (O. Guineensis); the *Merino* or *Spanish Sheep* (O. Hispanicus); the *English Sheep* (O. Anglicus), the sub-varieties of which are very numerous; the *French Sheep* (O. Gallicus); the *Many-horned Sheep* (O. Polyceratus), of Iceland and Norway; the *Cretan Sheep* (O. Strepsiceros), in Crete and Hungary; the *Long-tailed Sheep* (O. Dolichura), of Southern Russia; and the *Broad-tailed Sheep* (O. Laticaudata), of which there are several varieties.

Bos—*Ox*. Amongst the variety of animals which have been provided by the bountiful hand of Nature to supply the wants of man, there are none, perhaps, on which the necessities of life so much depend as on those which compose this genus. From them we are supplied with milk, butter, tallow, hides, and a variety of other articles, too numerous to be detailed here.

The animals which form this genus live in herds; the female generally goes with young between nine and twelve months, and after she has calved, hides her offspring in some unfrequented spot, to which she repairs two or three times a day to suckle it; should it accidentally be discovered, the cries of the young animal soon bring the herd, which quickly oblige the intruder to retire.

The species *Bull* (B. Taurus) is that from which it is supposed our domestic animals are derived, and that the trivial points in which they differ are depending upon accident, or the state in which they live. They are found in all parts of the world, under very trifling differences, depending upon local circumstances. The wild species are to be found in small numbers in Poland, the Carpathian Mountains, Lithuania, and about Mount Caucasus. The tame species, from which all the improved breeds have originally been formed, are natives of Poland and Holstein, and are the finest and largest. The smallest cattle are to be found in Scotland, and very frequently both males and females have no horns.

The *American Bison* (B. Americanus or B. Urus), shown on Plate 21, is considered the largest quadruped next to the Rhinoceros, and is very wild. These animals are remarkably swift, so as easily to escape from the Indians. They are hunted in various parts of America in different modes.

The *Buffalo* (B. Bubalus) very much resembles the common Ox; it is, however, distinguished from it by having the head smaller and ears larger; the horns are very large. They are found wild in India and Africa, more particularly near the Cape of Good Hope. That daring African hunter, Mr. Gordon Cumming, had several encounters with these animals, his account of one of which we transfer to our pages:—

“After following the other two at a hard gallop for about two miles, I was riding within five yards of their huge broad sterns. They exhaled a strong bovine smell, which came hot in my face. I expected every minute that they would come to bay, and give me time to load; but this they did not seem disposed to do. At length, finding I had the speed of them, I increased my pace; and going ahead, I placed myself right before the finest Bull, thus expecting to force him to stand at bay; upon which he instantly charged me with a low roar, very similar to the voice of a lion. Colesberg [Mr. C.'s horse] neatly avoided the charge, and the Bull resumed his northward course. We now entered on rocky ground, and the forest became more dense as we proceeded. The Buffaloes were evidently making for some strong retreat. I, however, managed with much difficulty to hold them in view, following as best I could through thorny thickets. Isaac rode some hundred yards behind, and kept shouting to me to drop the pursuit, or I should be killed. At last the Buffaloes suddenly pulled up, and stood at bay in a thicket within twenty yards of me. Springing from my horse, I hastily loaded my two-grooved rifle, which I had scarcely completed when Isaac rode up and inquired what had become of the Buffaloes, little dreaming that they were standing within twenty yards of him. I answered by pointing my rifle across his horse's nose, and letting fly sharp right and left at the two Buffaloes. A headlong charge, accompanied by a muffled roar, was the result. In an instant I was round a clump of tangled thorn-trees; but Isaac, by the violence of his efforts to get his horse in motion, lost his balance, and at the same instant, his girths giving way, himself, his saddle, and big Dutch rifle, all came to the ground together, with a heavy crash, right in the path of the infuriated Buffaloes.

Two of the dogs, which had fortunately that moment joined us, met them in their charge, and, by diverting their attention, probably saved Isaac from instant destruction. The Buffaloes now took up another position in an adjoining thicket. They were both badly wounded, blotches and pools of blood marking the ground where they had stood. The dogs rendered me assistance by taking up their attention, and in a few minutes these two noble Bulls breathed their last beneath the shade of a mimosa grove. Each of them, in dying, repeatedly uttered a very striking, low, deep moan. This I subsequently ascertained the Buffalo invariably utters when in the act of expiring.

"Isaac did not soon forget his adventure with the Buffaloes; and at night over the fire he informed my men that I was mad, and that any man who followed me was going headlong to his own destruction."

ORDER IX.—CETACEA. CETACEAN.

THIS order, the largest of all the orders of the class Mammalia, consists of animals destitute of limbs on the hinder parts of their body. In their general form they resemble the class *Pisces*; and, with two exceptions only, they are all inhabitants of the deep. Like the other orders of the Mammalia, they have warm blood; they also breathe through lungs—the wonderful structure of which, and the large reservoirs they possess for arterial blood, enable them to remain under water a considerable time after they have been to the surface for a renewal of atmospheric air. Their order is named from the Latin *Cete*, "Whales."

Family—GRAZERS; *Herbivora*.

The members of this family are distinguished from the *Spiracularia* by the nature of their food; the latter being, more or less, flesh-eaters, while the former live upon vegetable productions.

ILLUSTRATIVE EXAMPLES.

PLATE 22.		
Genera.	Species.	Common Name.
Manatus	Americanus	American Manatee.
Halicore	Dugong	Dugong.
Rytina	Stelleri	Steller's Rytina.

CHARACTERS OF THE GENERA.

1. **MANATUS** (Lat. *manus*, a hand). Head not distinct from the body; neither incisive nor cuspid teeth; molar teeth eight on each side in both jaws, with square crowns having six tubercles in two transverse ridges; eyes very small; body oblong, very sparingly covered with hair, tapering towards the tail, and terminating in an elongated, oval fin; two pectoral teats; anterior limbs finiform, five-toed, furnished with four nails; hind limbs covered by the skin and not visible externally.

2. **HALICORE** (Gr. *ἅλιος*, *marine*, and *κόρη*, *a maid*). In the upper jaw a pair of short conical tusks, occupying the place of the incisive teeth, which are wanting in both jaws; no cuspid teeth; molars three on a side in each jaw far back; muzzle obtuse; no auricles, but the auditory openings very small, and at some distance behind the eyes; the fore legs distinct, the feet enclosed in skin forming fins; rudiments of hinder extremities are found in the muscles opposite the lumbar vertebra, but do not appear externally.

3. **RYTINA** (Gr. *ρύτις*, *a wrinkle*). Neither incisive, cuspid, nor any true molar teeth, but in the place of the latter a pair of bones with irregular surfaces, one in the palate and the other in the lower jaw; muzzle obtuse; no auricles; body covered with a rough, fibrous, and thick cuticle, of a lengthened form and tapering towards the tail; teats pectoral; fore limbs arm-shaped, terminating in a hoof-like callus, but without any toes; hind limbs, if any, not visible externally.

CETACEA.—DESCRIPTION OF THE SPECIES.

MANATIS—the *Manati*. These animals live in herds near the mouths of rivers, and are rarely seen at any distance from land; they come into the

shallows to feed on a peculiar kind of grass, as they are entirely herbivorous, but never come ashore. They are timid, but warmly attached to their young, which they carry on their fins for some days after birth. The Manatees are the animals which have been so often mistaken for Mermaids by sailors, to which the position of their teats and their increased size during gestation have led.

The species *M. Americanus* (Plate 22) is about twelve feet long: it is found in the Amazon and Oronoque rivers, and also in the rivers of Cayenne and the Antilles, but lately it has become scarce.

Another species is the *M. Senegalensis*, found at the mouths of the rivers on the African coast. In length it does not exceed eight feet, which was the principal point of distinction noticed between it and the preceding species, till Cuvier observed a difference of formation in the skull.

HALICORE—*Dugong*. This animal, which is figured on Plate 22 has a rounded body, diminishing towards the tail, which is broad, horizontal, and crescent-shaped; the skin is thick, smooth, bluish above, and white below, and sprinkled with a very few hairs.

The Dugongs are natives of the East Indian seas, and common at Singapore; they are caught about eight or nine feet in length, but when larger generally escape, and therefore to what size they attain is not known. It feeds on algae and other marine vegetables, which grow in these places, browsing on them in much the same manner as a cow.

RYTINA—*Stellerine*. There is but one species known, the *Trichechus Borealis* of Shaw, and the *R. Stelleri* of Illiger, who so named it from the wrinkled appearance of its skin. (Plate 22.) It is about twenty-three feet in length, and eight thousand pounds in weight. The body is covered with a very thick hide, the cuticle of which resembles the bark of the *Quercus Annua* rather than cuticle; it is black, rough, wrinkled, so hard and tough as scarcely to be cut with an axe, about an inch thick, and not hairy. When cut through transversely it resembles ebony both in colour and smoothness. The use of this thick covering is evidently not only to preserve the vital heat, but also to protect them against the blows they are exposed to when thrown about by the waves upon the rocks and among the ice whilst in search of food.

These animals are fond of shallow, sandy places upon the sea-shore, but, attracted by the sweetness of the water, they freely resort in herds to the mouths of rivulets, always keeping the young and weakly in the centre of the flock. Their conjugal attachment is so great that, if the female be hooked, her mate will, after having made fruitless efforts for her release, and in spite of the blows inflicted on him by the fishers, dash on shore to her, though dead, with the swiftness of an arrow. And Steller mentions that he saw a male visit his dead mate not only on the second day when she was cut in pieces, but also on the third.

Family—SPOUTERS; *Spiracularia*.

This family is distinguished by a peculiar nasal organization, enabling them to eject from their nostrils, or blow-holes, large quantities of water which rush in at their capacious mouths when opened to seize their prey.

ILLUSTRATIVE EXAMPLES.

PLATE 23.		
Genera.	Species.	Common Name.
Delphinus	Delphis	Common Dolphin.
Monodon	Monoceros	Narwhal.
Physeter	Macrocephalus	Cachalot or Spermaceti Whale.
Balaena	Mysticetus	{ Common Greenland or Whalebone Whale.

Another Genus of this family:—*Uranodon*.

CHARACTERS OF THE GENERA.

DELPHINUS. Teeth in both jaws, single and generally conical.

MONODON (Gr. *μόνος*, *single*, and *ὀδὸν*, *a tooth*). Two teeth, of which one is generally deficient in the extremity of the upper jaw, very long, projecting, pointed and directed forwards in the axis of the body; no other

teeth; blow-hole single, and on the back of the head; pectoral limbs webbed, no hind limbs.

PHYSETER (Gr. *φυσάω*, *I blow*). Head of very great size; in the upper jaw no teeth, or if there be any very small; lower jaw received within the upper, and armed with from eighteen to twenty-four large conical pointed teeth.

BALENA (Gr. *φάλαινα*, a *Whale*, according to J. Johnston, from *βάλλω*, to cast up, because the animal throws up water). Instead of teeth, pendulous horny laminae, triangular and fibrous at their edges; distinct frontal spiracles; anterior extremities pinnated, posterior none; tail horizontal, with or without the dorsal fin; two inguinal teats.

URANODON (Gr. *ουρανή*, a *palate*, and *ὀδὸν*, a *tooth*). Forehead high, very convex, and rising suddenly from the snout; lower jaw larger and longer than the upper; body lengthy, and its greatest girth in the region of the pectoral fins, which are small and oval.

SPIRACULARIA.—DESCRIPTION OF THE SPECIES.

DELPHINUS—Dolphin. The Dolphins are the most ferocious of the order *Cetacea*. They have been divided by Cuvier into four subgenera, the last of which differs very much from the others in having palatine teeth, and but two teeth in the lower jaw:—

First, the Dolphins Proper, which have the mouth projecting so as to form a kind of beak.

Species—the *Dolphin* (*D. Delphis*), an animal about ten feet long, and almost straight, the back being but slightly curved, and the body slender; the beak is flattened from above to below, and each jaw is provided with from forty-two to forty-seven slightly curved conical teeth; the blow-hole is placed in the middle of the head; skin smooth; colour of the back dusky, becoming lighter on the sides, and white on the belly. It swims with great rapidity, and leaps so high out of water as occasionally to throw itself upon a ship's deck. The position into which the Dolphin puts himself at the time of taking its leap, probably first induced the ancients to paint and engrave it in the unnatural form in which it may be seen in most of their representations. They esteemed the Dolphin as a sacred fish (*Athenæus*, vii. 7), and believed that it was the only animal without a gall (*id.* viii. 12). (Plate 23.)

The *narrow-snouted Dolphin* (*D. Rostratus*), the front of the head of which is more prominent, and the jaws more lengthened and slender than in the other species.

The *Great Dolphin* (*D. Tursio*) is about fourteen feet long.

Second, the *Porpoisses* which have not the mouth beaked, but short and regularly prominent.

The *Porpoise* (*D. Phocæna*) does not measure more than five feet; its body is very thick towards the head, but becomes more slender towards the tail; nose projects but little; teeth between fifty and sixty in each jaw; eyes small; blow-hole on the top of the head; it is black above and white below. They are very common upon our coasts, and are most numerous during the Mackerel and Herring seasons, pursuing their prey with as great eagerness as Dogs.

The *Grampus* (*D. Orca*) is the largest of the genus, attaining from twenty to twenty-five feet in length; it is remarkably thick in proportion, one of eighteen feet measuring ten feet in diameter; it is a very voracious animal, and a great enemy to the Whale, which it pursues in herds, and destroys.

Third, the *Delphinapteres*, which resemble the Porpoisses, but have no dorsal fin.

The *Beluga* (*D. Leucus*) is about the size of the Grampus; it swims very swiftly, and is a native of the northern seas, particularly about Davis's Straits.

Fourth, the *Bottleheads*, now formed into a distinct genus: see **URANODON**.

The *Bottle Head* (*C. Bidens*) resembles the Dolphin in appearance, but is much shorter; the pectoral and dorsal fins are small. It is caught in the northern seas and in the English Channel.

MONODON—Narwhale. The general form of the Narwhale resembles that of the Porpoise, but is rather longer in proportion.

The *Narwhale* (*M. Monoceros*) is about fifteen feet in length, exclusive of the tusk, which is about five feet more; the head is blunt, the body rather conical with a ridge extending along the back, and probably supplying the place of the absent dorsal fin; some are grey, some black, and others of a shining white or tinged with light grey, and marked with little, unequal, irregular, black spots; the under surface pure white, and quite smooth. They are natives of the northern seas. (Plate 23.)

PHYSETER—Cachalot, or Spermaceti Whale. The animals forming this genus are natives of the Polar seas, but like most others of this family they pass into warmer seas for the purpose of breeding, and afterwards return to their original abodes. Two important articles of commerce, viz., Spermaceti and Ambergris, are obtained from them. They are ranged in two divisions.

First: without a dorsal fin. The *Great-headed Cachalot*, or *Spermaceti Whale* (*P. Macrocephalus*): the head of this animal is of remarkable size, equalling one-third or one-half of the entire bulk of the animal. This arises not from the size of the brain-case itself, but from a large cavity situated above it, and which contains fat in different states of consistence, and also the peculiar substance called spermaceti.

"The tongue," says Mr. Hunter, "is almost like a feather bed." The eyes are small but prominent, so that the animal is able to pursue its prey in a direct line. The orifice of the ear is extremely small. The nostrils open by a single aperture near the fore and upper part of the head, and the water ejected is not thrown directly upwards, but forwards in a curved line, so that it falls before instead of upon the head of the animal; but when enraged it is said that the water is thrown up vertically; they stay longer under water than the Whales, and the larger the Cachalot is the more frequently does it spout, and the longer does it remain under water. The whole length of the animal is seventy or eighty feet; its back is grey, inclining more or less to blackish or greenish, and its belly whitish, as also are the spaces around the eyes. It is found in all seas, but especially in the Atlantic, washing the shores of Mexico and Peru, and the neighbouring islands. (Plate 23.)

Besides the two kinds of fat which are found in all cetaceous animals, viz., the internal, which is the least fluid, and is nearly of the consistence of hog's lard, and the external, which is fluid, and known as train-oil, the Cachalot has another totally different, called spermaceti. It is found in smaller proportions than the other fat in every part of the body, except in the head, where, though mixed with the oil, it is in much greater quantity.

Ambergris, which is found upon the sea, the sea-coast, or the sand near the sea-coast, especially in the Atlantic, on the coast of Brazil and Madagascar, on the coast of Africa, the East Indies, China, Japan, the Moluccas, and the Bahamas, is sometimes found in the bellies of Whales, especially in the belly of the Spermaceti Whale. But it is remarkable that all the Cachalots in which ambergris is met with appear torpid and sick, and are constantly leaner than the others; and when one of these is hooked, the fishers immediately rip up the belly, and opening the intestines from the vent upwards they find the ambergris in lumps of from three to twelve inches in diameter, and from one to twenty or thirty pounds in weight, at the distance of two, but more commonly of six or seven feet from the vent, and never higher up in the intestines. When first taken out it has nearly the same colour and disagreeable smell as the dung in which it is found; but on exposure to air by degrees it not only grows greyish, and its surface becomes covered with a greyish dust like old chocolate, but it loses its disagreeable odour, and after a time acquires the peculiar smell agreeable to most persons.

In Asia and Africa ambergris is used not only as a medicine and as a perfume, but also in cookery as a spice. Great quantities are bought by the pilgrims travelling to Mecca, probably for offerings and to be used as frankincense.

Second: with a dorsal fin. Three species are named—the *High-finned*

Cachalot (*P. Tursio*), the *P. Microps*, and the *P. Orthodon*, natives of the North Seas.

BALÆNA—Whale. The head of this genus is remarkable for its great size, being a third and sometimes half of the whole body; the upper jaw is furnished with plates of a horny structure, which arranged transversely in several rows, and encompassing the outer skirts of the jaw, occupy the place of the teeth in other animals; they are thin and of a triangular shape, having their edges armed with long thread-like processes, which hang down loose in the mouth; this structure is well known by the name of Whale-bone, and is much used in commerce.

The spiracles, or blowholes, are curious parts in the economy of these animals; here it will be sufficient to mention, that the water having passed into a bag situated at the external orifice of the nostrils, is driven by a strong muscular effort through a straight passage at the top of the head, which is sometimes divided by a membrane making the blow-hole double.

Beneath the skin is found the blubber or fat enveloping the whole body of the animal; it is of a yellowish-white, yellow, or red colour; in some old animals it is of a salmon colour, whilst in the young it is always of a yellowish-white; from this substance Whale oil is procured.

These animals are viviparous, bringing forth one at a time, which they suckle and protect with great affection.

The *Common Whale* (*B. Mysticetus*): the average length is from fifty to sixty feet, and its greatest circumference about thirty or thirty-five feet.

Marten says, "the whole fish is shaped like a shoemaker's last, if you look upon it from beneath. The head is somewhat triangular, the under part formed by the jaw-bones being flat, and measuring from sixteen to twenty feet in length, and from ten to twelve feet in breadth; the lips are about the same length, and five or six feet high, having the appearance of the letter U when looked at in front." "When the mouth is open it presents a cavity as large as a room," Mr. Scoresby says, "and capable of containing a merchant ship's jolly-boat." Instead of teeth the mouth is provided with numerous rows of fins, or whalebone, and each series or "side of bone," as the whalers call it, is composed of more than 300 laminae, which are generally ten or eleven feet long, and occasionally fifteen feet; these are broadest at the gum, and are there about ten or twelve inches in breadth. The eyes are not larger than those of an ox, situated behind the angles of the mouth on the sides of the head. The external opening of the ear is but small, and has no auricle, so that some naturalists have believed that the Whale has no external ear, but Mr. Hunter's examination has proved the contrary.

When the animal breathes a moist vapour is thrown up, mixed with mucus, but no water is ejected unless the respiration be made under water; they make a great noise in blowing or breathing, which may be heard at a considerable distance, and they blow loudest when frightened; they respire about four or five times in a minute, and throw up the vapour many yards, which at a distance looks like smoke. The tail occupies a single surface of eighty or a hundred square feet; it is only five or six feet long, but from eighteen to twenty-four or twenty-six feet in breadth, and is placed horizontally; its motions are rapid and universal, and by it the animal is principally moved along, in the same way that a boat is sculled by a single oar.

Whales are believed to go with young about ten months, and the time of delivery is presumed to be in February or March; they very rarely have more than one cub at a time. The maternal affection of the Whale, though a dull animal, is very interesting; the cub, being unaware of danger, is easily harpooned; but the mother's attachment is such, that it frequently brings her within reach of the fishers, and she not uncommonly falls a victim to her parental fondness. A very striking instance of this is given by Mr. Scoresby; he says, "In June, 1811, one of my harpooners struck a sucker, with the hope that it would lead to the capture of the mother. Presently she arose close by the 'fast boat,' and seizing the young one, dragged about a hundred fathoms of line out of the boat with remarkable force and velocity. Again she arose to the surface, darted furiously to and fro, frequently stopped short or suddenly changed her direction, and gave every possible intimation of extreme agony. For a length of time she con-

tinued thus to act, though closely pursued by the boats; and inspired with courage and resolution by her concern for her offspring, seemed regardless of the danger which surrounded her. At length one of the boats approached so near that a harpoon was hove at her. It hit, but did not attach itself. A second harpoon was struck, this also failed to penetrate; but a third was more effectual, and held. Still she did not attempt to escape, but allowed other boats to approach, so that in a few minutes three more harpoons were fastened, and in the course of an hour afterwards she was killed."

The Whale is remarkably timid, setting off with the greatest agitation on the least alarm; its bitterest enemies are the Shark and Sword-fish, and it avoids those seas where Sharks abound.

Other species—the *Fin Whale* (*B. Physalis*), the *Pike-headed Whale* (*B. Boops*), and the *Sharp-nosed Whale* (*B. Rostrata*).

Of the Mode of Capturing Whales.—When a Whale is seen by the watch in the crow's-nest, he gives notice to those on deck, who immediately lower the boats and hasten to the place. If the animal lie basking upon the surface incautiously, the boat is rowed upon it, and, before it touches, the harpooner strikes it; the animal immediately dashes off and runs out with the line; directly the Whale disappears a flag is set up in the first boat, and the rest of the boats put out to its assistance, shouting "a fall!" It remains under water about thirty minutes, and when it rises is struck again and plied with the spears; this is continued till, by repeated attacks and attempts to escape, the animal becomes exhausted, and indicates its approaching death by throwing up bloody mucus and air from its blowholes, tinging the sea to a considerable extent with its blood. When dead it turns on its side or back, and this is announced by the delighted boats striking their flags and giving three cheers. The Whale is then secured to the boats, and by them towed toward the ship, where it is made fast on the larboard side. The head of the Whale is placed to the stern of the ship, and the tail forcibly drawn towards the fore-chains; the right side-fin is fastened to the gunwale, and the animal is then ready for the process of *flensing*, which is carried on in the following manner: the men, having their feet armed with *spurs*, descend on the Whale, and cut up the fat with blubber spades and knives into pieces of half a ton, which being raised on deck are divided into smaller pieces, a foot square, and thrust down a hole in the main hatches, where two men, called *kings*, pack it in proper places, called the *flens-gut*, in which it remains. They first commence with the under jaw and belly, and having taken off the fin, turn the Whale on its side, and the fat is again removed, together with the left fin. The lips are then taken away, and the whalebone removed and hoisted on deck, where it is split into "junks," having ten or twelve blades of whalebone in each. They continue turning the animal, which in technical language is called "kenting," till all the blubber has been removed, the tackle is then taken away and the carcass sinks.

When sufficient Whales have been taken to fill the *flens-gut*, they proceed with the "making off," as it is called, or finishing; this consists in cutting up the blubber and putting it into casks; for this purpose a long trough, called the "speck trough," is placed on deck, having a hole in it, to which is attached a canvas tube called a "lull," about a foot in diameter, and long enough to reach to the hold, which is closed by a pair of nippers (two sticks with a hinge at one end); along the trough blocks made of Whales' tails are placed, on which the blubber is cut up into pieces about four inches square, and pushed into the lull, from whence it is passed into the tubs in which it is to be conveyed home. When the cask is full, the lull is pressed close with the nippers, and the progress of the blubber impeded till another tub is brought. And such is the conclusion of the process till it arrives in England, where it is boiled and fitted for use.

URANODON—Bottlehead. Of this genus, which has also been described by Lacepède under the name *Hyperoodon*, but one species (*U. Bidens*) is known; it varies from twenty to twenty-five feet in length; its skin smooth and glossy; blackish, lead-coloured above, and whitish beneath. It is occasionally found in the British Channel, and extends up into the North Sea. According to Pennant they are very tame, follow ships a long way, and make but little noise in blowing.

CLASS II.—AVES.

Birds are separated from all other Vertebrate Animals by the beautiful organization which most of them possess for lofty and rapid flight. They are produced from eggs; hence they are called oviparous: they have warm blood, breathe through lungs, which are attached to their ribs; have a double respiration,—by their aorta, as well as by their pulmonary artery. Their heart has four cavities,—two auricles, and two ventricles: they are bipeds, and their body is covered with feathers.

ORDER I.—ACCIPETRES. PREYERS.

THIS order occupies among Birds a position not very dissimilar to that which the *Carnivora* sustains among the Quadrupeds. They have beaks and talons, hooked and strong, by which they seize and tear their prey: their muscular strength is very great, and the habits of many of them disgusting. Their appellation comes from the Latin *accipita*, “a hawk,” “a plunderer.”

Family—DIURNAL; *Diurna*.

These are birds of powerful flight; their plumage is close, and their quills strong: their eyes are directed sideways; and they seek their prey by day—hence they are called *Diurnal*.

ILLUSTRATIVE EXAMPLES.

PLATE 1.		
Genera.	Species.	Common Name.
Vultur - - - - -	Monachus - - -	Monk Vulture.
Sarcorampus - - - - -	Papa - - - - -	King Vulture.
Pernopterus - - - - -	Ægyptiacus - - -	Egyptian Vulture.
Gypaetos - - - - -	Barbatus - - -	Alpine Gypaete.

PLATE 2.		
Falco - - - - -	Peregrinus - - -	Peregrine Falcon.
	Pennatus - - -	Booted Buzzard.
	Ossifragus - - -	Sea Eagle.
Gypogeranus - - - - -	Capensis - - -	Cape Snake-eater.

CHARACTERS OF THE GENERA.

1. VULTUR; 2. SARCORAMPHUS; 3. PERCNOPTERUS. Beak large and strong, much deeper than its width, and its base covered with a cere; upper strongly curved at its tip; lower slightly inclined inwards at its tip; nostrils naked; head and neck more or less naked, sometimes covered with short down, sometimes bare with a few scattered hairs; sometimes the upper and lateral parts of the head and neck ornamented with wattles or folds of skin; base of the neck generally surrounded with a ruff or collar of lengthy feathers; wings long; feet strong; middle toe very long, and connected with the outer at its base; claws slightly curved, and comparatively short.

The same characters generally apply to the three genera.

4. GYPAETOS (Gr. γύψ, a Vulture, and αἰτός, an Eagle). Beak of moderate size, thickish, strong, straight, arched, and hooked at the tip, and the base cerigerous; nostrils oval, and covered with stiff hairs or narrow feathers inclining forward, and a tuft of hair forming a beard beneath the lower mandible; wings very long, the first quill shorter than the second, and the third the longest; *tarsi* short and feathered to the toes, of which there are four, the three anterior connected by a short membrane, and the middle one very long; the talons slightly curved, strong, and very short.

5. FALCO (Lat. *falx*, a hook, or bill). Beak hooked; nostrils lateral; head thickly feathered; upper margin of the orbit projecting, so as to make the eyes appear sunken; feet strong; middle toe the longest; upper part of the toes scutulate, with strong, moveable, retractile, curved and very short claws.

6. GYPOGERANUS (Gr. γύψ, a Vulture, and γέρανος, a Crane). Head thickly feathered; beak shorter than the head, thick and strong, curved almost from the base, and hooked at the point, which is compressed; ocular circle naked; nostrils in the cere oblong, expanded, and open; bend of the wings protected with three bony tubercles: wings long; legs very

long, the *tibiae* feathered, the *tarsi* more than twice the length of the front toes, which are united at their roots by membrane, the skin beneath warty; claws slightly curved, strong, and sharp.

DIURNA.—DESCRIPTION OF THE SPECIES.

VULTURE. The whole sub-family of Vultures have acquired an ill name, though, as is not unfrequently the case, without cause; for although their habits are not of the most attractive kind, yet they are inoffensive, and of great usefulness in warm climates, especially by the quickness with which they discover, and the speed with which they remove, dead animal matter, which, if left, would fester in the sun's heat, and render pestilent the surrounding atmosphere. Though the Vultures have neither the disposition nor courage of the Falcons, to attack living prey, and are destitute of the strongly-curved and pointed beak and claws necessary for such purpose, yet do their external characters sufficiently indicate their fitness for the purposes to which they are destined. Their head and neck, small in comparison with their general size, and the neck often long and slender, are bare or covered only with down, which is less soiled by the filthy carrion in which, whilst feeding, they are immersed, than feathers would be. Their beak, curved only at the tip, and unarmed with any tooth or festoon, is still sufficiently sharp to tear their food to pieces, as are also their slightly-curved claws, connected however with powerful legs covered only with reticular scales, sufficient to hold tightly their inanimate prey. Their flight, although gentle, is remarkable for its great height, as, notwithstanding their large size, they soon rise, in whirls, so high in the air as to become completely invisible; whilst, on the contrary, where but now not a Vulture can be seen, in a few minutes, on a fitting opportunity, as, for instance, the death of an animal, the sky becomes darkened with them. To account for the remarkable celerity with which they discover their prey, it has generally been considered that the great development of their olfactory organs indicates this faculty to depend on the delicacy of their scent. But of late years the celebrated naturalist Audubon has maintained that they are directed to their prey, whilst soaring watchfully aloft, by the extreme sharpness of their vision.

Species—the *Sociable Vulture* (*V. Auricularis*) measures upwards of ten feet in the expanse of the wings: it is a rare species. It is very common in the Namaqua country, where it is called the *Ghaip*, and in the interior of Southern Africa. The *Pondicherry Vulture* (*V. Ponticerianus*) is no more than about two feet five inches in length, being scarcely larger than a goose; common in Bengal, Java, and Sumatra. The *Imperial Vulture* (*V. Imperialis*), rather more than three feet in length, a native of India. The *Crested Black Vulture* (*V. Ægyptius*), about three feet and a half in length; found on the high mountains of Africa, Asia, and Europe. The *Cinereous Vulture* (*V. Arrianus*), three feet and a half in length; found in the mountains and forests of Hungary, of the Tyrol, Sardinia, the Pyrenees, and of the south of Spain and Italy; also found in India and Egypt. Temminck says there is no difference between those of Asia and Africa and the European species, and therefore quashes the several specific titles, *Cinereus*, *Bengalensis*, *Vulgaris*, *Niger*, and *Cristatus*, and employs the term *Arrianus*, proposed by Picot la Peyrouse in his *Zoolog. des Pyren.*

The *Griffon Vulture* (*V. Fulvus*) is four feet in length, and more than twice as much in the expanse of its wings; it is found on the lofty mountains of the old world. It generally makes its nest in the clefts of rocks; but in Sardinia builds on the highest forest oaks a nest of sticks about three feet wide. When once set to its meal, it does not leave it for days,

so long as a morsel of flesh remains, gorging itself so completely, that, if disturbed soon after its meal, it is incapable of rising till it has ejected the contents of its crop.

The *Indian Vulture* (*V. Indus*), about three feet and three inches in length, or about the size of a turkey. *Kolbe's Vulture* (*V. Kolbii*), rather less than *V. Auricularis*, is a native of Africa, India, and Java; and the *Angola Vulture* (*V. Angolensis*), native of the western and northern parts of Africa.



Griffon Vulture.

The *Hooded* or *Monk Vulture* (*V. Galerulatus*), shown on Plate 1, is two feet five inches in length; beak yellow; its cere blue; naked parts of the head and neck red, rosy, or white, according to the quantity of blood sent to the skin; neck, back, scapulars, and belly pure white, often interspersed with a few tawny feathers; the collar of white feathers, separating the neck from the chest, and rising upon the back, forms a sort of mantle or hood of greater height than in the other species; general colour of the plumage blackish-brown: is a native of the western and northern parts of Africa.

SARCORAMPHUS—Condor. This genus is one of a distinct character, remarkable for their feeble snorting voice, caused by the absence of tracheal muscles. The bird figured on Plate 1—the *King Vulture* (*Sarcorampus Papa*)—is the most beautiful, although one of the smallest of the family of Vultures, being only about the size of a goose. Its dignified title is one of comparison, having been given to it from the fact that the Gallinagos, with which it is allied in many particulars, immediately desert their prey through fear on the approach of this bird, which is, as is well known, both inferior in strength as well as in size to others of the Vulture family.

The plumage of the King Vulture is marked with bright colours, strongly contrasted; the head and neck are tinged with brilliant colours, as orange, purple, violet; the ruff on its neck is gray, the back and tail a bright fawn, which becomes darker as age advances; the eye is circumscribed with a scarlet line, and the legs are dusky black or reddish. It is of the same family as the Great Condor, concerning which so much has been written by travellers in South America. Mr. Darwin's account is worth transcribing:—

“April 27.—This day I shot a Condor. It measured from tip to tip of the wings eight and a half feet, and from beak to tail four feet. This bird is known to have a wide geographical range, being found on the west coast of South America, from the Strait of Magellan along the Cordillera as far as eight degrees N. of the equator.

“With respect to their propagation, I was told by the country people in Chile, that the Condor makes no sort of nest, but in the months of November and December lays two large white eggs on a shelf of bare rock. It is said that the young Condors cannot fly for an entire year; and long after they are able, they continue to roost by night, and hunt by day with their parents. The old birds generally live in pairs; but among the inland basaltic cliffs of the Santa Cruz, I found a spot where scores must usually haunt. On coming suddenly to the brow of the precipice, it was a grand spectacle to see between twenty and thirty of these great birds start heavily from their resting-place, and wheel away in majestic circles. From the quantity of dung on the rocks, they must long have frequented this cliff for roosting and breeding. Having gorged themselves with carrion on the plains below, they retire to these favourite ledges to digest their food. From these facts, the Condor, like the Gallinazo, must to a certain degree be considered as a gregarious bird. In this part of the country they live altogether on the guanacos which have died a natural death, or, as more commonly happens, have been killed by the pumas. I believe, from what I saw in Patagonia, that they do not on ordinary occasions extend their daily excursions to any great distance from their regular sleeping-places.

“The Condors may oftentimes be seen at a great height, soaring over a

certain spot in the most graceful circles. On some occasions I am sure that they do this only for pleasure, but on others, the Chileno countryman tells you that they are watching a dying animal, or the puma devouring its prey. If the Condors glide down, and then suddenly all rise together, the Chileno knows that it is the puma which, watching the carcass, has sprung out to drive away the robbers. Besides feeding on carrion, the Condors frequently attack young goats and lambs; and the shepherd dogs are trained, whenever they pass over, to run out, and looking upwards to bark violently. The Chilenos destroy and catch numbers. Two methods are used; one is to place a carcass on a level piece of ground within an enclosure of sticks with an opening, and when the Condors are gorged, to gallop up on horseback to the entrance, and thus enclose them: for when this bird has not space to run, it cannot give its body sufficient momentum to rise from the ground. The second method is to mark the trees in which, frequently to the number of five or six together, they roost, and then at night to climb up and noose them. They are such heavy sleepers, as I have myself witnessed, that this is not a difficult task. At Valparaiso, I have seen a living Condor sold for sixpence; but the common price is eight or ten shillings. One which I saw brought in had been tied with rope, and was much injured; yet the moment the line was cut by which its bill was secured, although surrounded by people, it began ravenously to tear a piece of carrion. In a garden at the same place, between twenty and thirty were kept alive. They were fed only once a week, but they appeared in pretty good health. The Chileno countrymen assert that the Condor will live, and retain its vigour, between five and six weeks without eating: I cannot answer for the truth of this, but it is a cruel experiment, which very likely has been tried.

“When an animal is killed in the country, it is well known that the Condors, like other Carrion-Vultures, soon gain intelligence of it, and congregate in an inexplicable manner. In most cases it must not be overlooked, that the birds have discovered their prey, and have picked the skeleton clean, before the flesh is in the least degree tainted. Remembering the experiments of M. Audubon, on the little smelling powers of carrion-hawks, I tried in the above-mentioned garden the following experiment: the Condors were tied, each by a rope, in a long row at the bottom of a wall; and having folded up a piece of meat in white paper, I walked backwards and forwards, carrying it in my hand at the distance of about three yards from them, but no notice whatever was taken. I then threw it on the ground, within one yard of an old male bird; he looked at it for a moment with attention, but then regarded it no more. With a stick I pushed it closer and closer, until at last he touched it with his beak; the paper was then instantly torn off with fury, and at the same moment every bird in the long row began struggling and flapping its wings. Under the same circumstances, it would have been quite impossible to have deceived a dog. The evidence in favour of and against the acute smelling powers of Carrion-Vultures is singularly balanced. Professor Owen has demonstrated that the olfactory nerves of the Turkey-Buzzard (*Cathartes aura*) are highly developed; and on the evening when Mr. Owen's paper was read at the Zoological Society, it was mentioned by a gentleman that he had seen the Carrion-Hawks in the West Indies on two occasions collect on the roof of a house, when a corpse had become offensive from not having been buried: in this case, the intelligence could hardly have been acquired by sight. On the other hand, besides the experiments of Audubon and that one by myself, Mr. Bachman has tried in the United States many varied plans, showing that neither the Turkey-Buzzard (the species dissected by Professor Owen) nor the Gallinazo find their food by smell. He covered portions of highly-offensive offal with a thin canvas cloth, and strewed pieces of meat on it; these the Carrion-Vultures ate up, and then remained quietly standing, with their beaks within the eighth of an inch of the putrid mass, without discovering it. A small rent was made in the canvas, and the offal was immediately discovered; the canvas was replaced by a fresh piece, and meat again put on it, and was again devoured by the Vultures without their discovering the hidden mass on which they were trampling.

“When the Condors are wheeling in a flock round and round any spot, their flight is beautiful. Except when rising from the ground, I do not

recollect ever having seen one of these birds flap its wings. Near Lima, I watched several for nearly half an hour, without once taking off my eyes: they moved in large curves, sweeping in circles, descending and ascending without giving a single flap. As they glided close over my head, I intently watched, from an oblique position, the outlines of the separate and great terminal feathers of each wing; and these separate feathers, if there had been the least vibratory movement, would have appeared as if blended together; but they were seen distinct against the blue sky. The head and neck were moved frequently, and apparently with force; and the extended wings seemed to form the fulcrum on which the movements of the neck, body, and tail acted. If the bird wished to descend, the wings were for a moment collapsed; and when again expanded with an altered inclination, the momentum gained by the rapid descent seemed to urge the bird upwards with the even and steady movement of a paper kite. In the case of any bird *soaring*, its motion must be sufficiently rapid, so that the action of the inclined surface of its body on the atmosphere may counterbalance its gravity. The force to keep up the momentum of a body moving in a horizontal plane in the air (in which there is so little friction) cannot be great, and this force is all that is wanted. The movement of the neck and body of the Condor, we must suppose, is sufficient for this. However this may be, it is truly wonderful and beautiful to see so great a bird, hour after hour, without any apparent exertion, wheeling and gliding over mountain and river."

PERCNOPTERUS. Neck feathered; bill slender; size moderate.

The species *P. Ægyptiacus* is found in Spain, Portugal, Malta, Turkey, and is common in Arabia, Persia, and Africa. Travellers speak of its utility in removing much of the offal and filth of eastern towns, for which services the superstitious Ægyptians paid it divine honours, dignifying it with the title of Pharaoh's Chicken. (Plate 1.)

GYPAETOS. The Gypaeti are remarkable for the keenness of their sight, which enables them at an immense height to observe when a sheep (its usual prey), separating itself from the flock, strays to the edge of a precipice; immediately the bird stoops upon it, and by its weight, together with the force collected in its descent, tumbles it over, and, when thus disabled by the fall, devours it. The stories related of its carrying off animals, and even children, in its talons, are absurd, for its claws are ill adapted to that purpose, and it never attacks an animal till it is disabled either by sickness or the mode just described, or when it is young; nor is it even averse to dead animals, or parts of them.



The Gypaetos.

The *Alpine Gypaete* (*G. Barbatus*) is the largest, and fortunately the rarest bird of prey found in the Old World; it measures about four feet and a half in length, and from nine to ten in width. It feeds upon Chamois Goats, Sheep, Calves, and young Deer; but when pressed by hunger will devour carcasses. It is found in the Swiss Alps, is common in the Tyrol and Hungary, but very rare in Germany and the Pyrenees; and builds its nest in the most inaccessible rocks, where it lays two rough white eggs, spotted with brown. (Plate 1.)

This bird is the *Lämmer Geyer* of the Germans, and was confounded with the Condor by Cuvier, though their generic distinctions are sufficiently obvious.

FALCO. The Falcons, as a genus, are all rapacious; but they differ in the kind of prey on which they feed, the methods which they employ in taking it, and the facility with which they can be instructed for, and subdued to, the use of man. Hence has originated the old division of this

genus into the noble and ignoble birds of prey; and it may seem strange that the Eagle, the king of the birds, is not to be found in the first. Large in size, however, as it is, and powerful above all the other individuals of the genus, it still is far short of the true Falcons, or even the Hawks, in ardour of pursuit, and in the dexterity employed by them to seize their prey; for whilst these strike their victim on the wing, and with a speed and certainty almost incredible, the Eagles are capable of capturing such prey only as they can seize on the ground,—in this particular resembling the Buzzards and the Kites, the former of which are remarkable for their indolence, and the little activity they exhibit in their predatory pursuits.

All the species of this genus are monogamous, or living in pairs; and the male is a third less in size than the female, whence it has been called a *Tiercelet*.

The Falcons are arranged into seven subgenera:—

1. Falcons—including such species as are remarkable for their courage, whence they have been called the *noble birds of prey*. They are extremely docile, and on that account are chosen for the purposes of falconry, in which they are trained at the order of their master to pursue other birds, and return obedient to his call.

The *Peregrine Falcon* (Plate 2), also called the *Passenger Falcon*, belongs to this division. It is about fifteen inches in length, and bears a great resemblance to the Hobby. The upper parts are ashy blue, the head and upper part of the neck are black, the beak is blue, the cere yellow, as is also the skin encircling the eyes and the iris; the throat is white, and slightly marked with delicate, longitudinal, black stripes, the other inferior parts white, and striped transversely with brown; the feet yellow. It is a native of all the mountainous districts of Europe, and rarely seen in the low grounds, but never in marshes.

The following are species of this division:—The *Hobby*, the *Merlin*, the *Kestrel*, natives of England; the *Jer-Falcon*, the *Lanner*, and the *Ingrian Falcon*, of Northern Europe; the *F. Tinnunculoides* and *F. Aldrovandi*, east and south of Europe; the *Fishing Falcon*, the *Black-thighed Falcon*, the *F. Punctatus*, the *Rufous-backed Kestrel*, from Africa, Mauritius, and the Cape; the *Carolina Kestrel*, the *Red-thighed Kestrel*, of America; and the *Hooded Falcon*, the *F. Chicquera*, and *F. Lophotes*, of India.

2. Hawks—remarkable for the rapidity of their flight, but they do not wheel in circles in the air except at pairing-time; they seize their prey on the wing; are cunning and cruel; they commonly live in the woods, and particularly in those which are near rocky situations.

The Hawks are themselves divided into *Goshawks* and *True Hawks*. Species of the former, varying in size from twelve to twenty-two inches, are found in Europe, America, the Tropics, and in New Holland; species of the latter, which have the tarsi rather long, smooth, and scutellated, are also widely extended, and under various appellations. The *Sparrow-hawk* belongs to this class: it is about twelve inches long, is common in Europe, and is very courageous; it is occasionally taught to fly at Partridges and Quails.

3. Eagles. These comprise the largest and most powerful birds of the genus: they stoop upon their prey, and bearing it aloft in their claws, carry it to their nest, where they tear it in pieces; they rarely feed upon carrion, except when pressed by hunger. Temminck thinks there exists no line of distinction between the Eagles and the Hawks.

They are divided into *True Eagles*, *True Fishing Eagles*, *Ospreys*, *Harpies*, and *Hawk Eagles*.

The *Booted Eagle* (Plate 2) is a species of the True Eagles. It is a beautiful bird, but is of small size, the male measuring only seventeen and the female eighteen inches. It is distinguished by a tuft of white feathers at the insertion of its wings, its legs feathered to the toes, and its tail entirely brown above; native of the eastern parts of Europe.

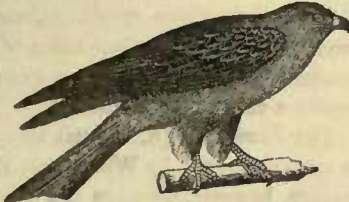
The *Sea Eagle* (Plate 2) belongs to the True Fishing Eagles. It is about three feet in length, and more than seven in width; when young, its plumage is brown, with a bright brown stripe down the middle of each



Head of Falcon.

feather; but as the bird's age advances, the plumage assumes an uniform brown ash colour, and the head and neck become pale, and incline to white. It is found in many parts of Europe and America; not unfrequently in England, commonly living either by the sea-shore or in the neighbourhood of large lakes, where it feeds mostly on fish.

4. Kites. Tarsi short; toes and claws weak, as is also the beak; wings very long; tail forked. The great length of their wings, and their forked tail, easily distinguish the Kites from the other subgenera; their flight is easy and graceful, and, owing to the forked tail, they are enabled to form sudden and rapid turns in the air, which is requisite, as they prey upon insects and small birds, which fly very quickly, although but for a short distance.



The Kite.

The Kite is very common in England; it flies high and very rapidly, but can see its prey from a great elevation, and drops upon it with much velocity; it feeds on small birds and other small animals, and so many as twenty Moles have been taken out of one nest.

5. Cymindis. This subgenus, as at present formed, seems to comprise individuals which differ very much from each other, but taken together, form a connection between the Hawks and the Buzzards, more particularly resembling the latter in the form of their feet.

6. Buzzards. These are divided into *Buzzards with short tarsi*, *True Buzzards*, and *Honey Buzzards*. Their general characteristics are—beak curved suddenly from the base; upper mandible not toothed; wings short, the third or fourth remiges the longest; tail even.

7. Caracaras. Ophthalmic region, throat, and crop more or less unfeathered; in some hairy and in others quite bare. The propriety of placing the Caracaras in the genus *Falco* has been doubted, on account of the naked parts about the head, which rather assimilate them to the Vultures, among which they have been ranged by Vieillot; but Temminck and Cuvier think them best placed among the Falcons.

GYPOGERANUS—*Secretary Bird* (G. Capensis). In size the Secretary Bird equals the Stork; it has the root of the beak and the ocular region covered with a bare orange-coloured skin; the gape wide, and the back of the head ornamented with a tuft of ten pendent feathers, which, having been supposed to bear a resemblance to a pen stuck behind the ear of a clerk, have given rise to its name Secretary Bird. The general colour of the bird is greyish. It is found in the neighbourhood of the Cape of Good Hope, where it builds its eyry on the top of a high thicket, lining it with wool and feathers; but towards Terra del Natal, where it is also found, it builds in high trees. Its food consists principally of reptiles, which it destroys by a stroke of its wings.

Family—NOCTURNAL; Nocturna.

Unlike the *Diurnal* Family, these Birds are not endowed with the power of strong flight. In seeking their prey by night they make no noise with their feeble and downy wings: they have large heads, and their eyes, which are large, and otherwise adapted for their nocturnal habits, are directed forwards. If attacked by day, they are unable to defend themselves.

ILLUSTRATIVE EXAMPLES.

PLATE 3.

Genus.	Species.	Common Name.
Strix - - - - -	Nyctea - - - -	Snowy Harfang, or Owl.
	Aluco - - - -	Brown Owl.
	Flammea - - - -	White Owl.
	Otus - - - -	Long-eared Owl.

CHARACTERS OF THE GENUS.

STRIX. Head large, fully feathered; face more or less flat, and surrounded with a more or less perfect ruff or disc, of small close-set feathers;

eyes very large, furnished with nictitating membranes, and contained in very wide orbits; irides brilliant, beak compressed and curved from its base; nostrils lateral, round, or oblique; wings rather pointed, varying in length, but never exceeding the tail; legs generally feathered to the claws; tail of moderate length and square; three toes in front and one behind, completely divided, the outer one reversible; claws powerful and retractile; plumage soft and downy.

NOCTURNA.—DESCRIPTION OF THE SPECIES.

The general appearance of the birds forming this genus is so marked, that, as has been well observed by the editor of the second volume of the "*Fauna Boreali-Americana*," "there is, as we believe, no one species yet discovered, which even a common observer would not immediately pronounce to be an Owl." They occupy an intermediate station between the Falcons, which, together with themselves, form the Accipitrine order, and with the Goatsuckers among Passerine birds.

The greater number of Owls are nocturnal or crepuscular, and are well fitted for this kind of life by the enormous size of their pupils, which enables them to see better during the duskiess of night, but in daytime admits so much light into the eye as to render them almost blind. Some, however, are not only able to bear daylight, but are even capable of encountering the glare of the sun, and to hunt in daytime with the keenness of Hawks; in such the irides are always bright yellow, whilst in those which are nocturnal they are brown. They feed on living prey, beetles, reptiles, small birds, and mice; and some of the larger and more powerful do not hesitate to get hold of turkeys, grouse, rabbits, and hares, and even fishes; but they never feed upon carrion except in extreme difficulty, when nothing else can be procured. They build in holes of walls or trees, and lay from two to four eggs; these when hatched present young covered with a downy coat, which do not leave the nest till they are competent to provide for themselves. They moult but once.

This genus is divided into Earless and Eared Owls.

First.—**EARLESS OWLS.** Characterised by their rounded heads without aigrettes, and by their broad face. These are separated into two sections, dependent on the length of the tail; their habits also are distinct.

1. Accipitrine or Hawk-Owls.

Species—the *Snowy Owl* (S. Nyctea). Head small, beak black, and entirely hidden by the bristly feathers at its base; plumage snowy-white, but more or less marked with brown spots or bars. According to Richardson it builds its nest upon the ground, and lays three or four white eggs, two only of which are hatched. It is very common in the more northern regions of both hemispheres. It feeds upon hares, rabbits, rats, lemmings, which it strikes down with its foot, also upon grouse, especially the ptarmigan. It flies swiftly, and its colour is well suited for concealment in passing over the snowy regions. Its note is very hideous, resembling the cries of a person in deep distress. (Plate 3.)

The *Ural Owl* (S. Uralensis) is nearly two feet in length; the tail very wedge-shaped; head very large; face wide, very fully feathered, and of a whitish-grey, encircled with a broad band of white feathers, spotted with black. In the young the ground colour of the plumage is pale greyish-brown. It feeds upon mice, and small birds, and also seizes hares and rabbits. It makes its nest in the hollows of trees and in the clefts of rocks, and lays three or four pure white eggs.

The *Little Hawk Owl* (S. Funerea) varies from fourteen to eighteen inches in length. It inhabits the Arctic circle both in the new and old world, whence it occasionally descends southward, when compelled by severity of weather and want of food.

The *Falconine Owl* (S. Choucou) having folded wings reaching to the middle of the tail, which is wedge-shaped, is found at the Cape of Good Hope. Its flight is very swift.

The *Variiegated Owl* (S. Nisus) is about fourteen inches long; general colour of the plumage brown, varied with ferruginous-white and black in irregular zones. Is found at the Cape of Good Hope.

The *Fasciated Owl* (*S. Lineata*) is about the same size as the last species. It is a native of Guiana, and also of Cayenne.

The *Cinereous Owl* (*S. Laponica*) is the largest species known; the male is two feet in length, and the female from two feet four inches to two feet eight inches in length. It is found in the woody districts between Lake Superior and lat. 67° or 68° from Hudson's Bay to the Pacific.

2. *Night Owls*. These, with the preceding section, form Savigny's genus *Noctua*: many of them are of small size, but their habits are generally nocturnal, and their motions slow and noiseless.

Species—the *Barred Owl* (*S. Nebulosa*) is about twenty inches in length. It is a native of the Arctic regions, and is found in Sweden, Norway, and North America. Its common food is mice and small game, but occasionally it seizes on fowls, partridges, and young rabbits; and Audubon was told that it also devoured fish. It is frequently observed flying during the day, and according to Wilson sees more distinctly at that time than many others of the same genus.

The *Brown Owl* (Plate 3), called also the *Tawny Owl* (*S. Aluco*), measures fourteen or fifteen inches in length; bill yellowish-white; head large and flattened towards the occiput; irides dark-bluish black; face white, tinged and barred with brown; upper parts marked with large deep brown spots, and with small ferruginous and white spots; upon the scapulars some large white spots; under parts reddish-white, with transverse brown bars. In the female the colours are much more red, and often ferruginous-red, and the transverse barring of the wings and tail are alternately ferruginous and brown. The first year's birds resemble the female, and have the irides brown: such have been considered a distinct species, and called *S. Stridula*, or *Tawny Owl*. This is one of the most common of the British species, and is also spread over Europe, preferring especially closely wooded districts, those particularly in which there is much fir, holly, and ivy. They build in the hollows of old trees, or will occupy a deserted crow's nest and lay four or five whitish eggs. During day it remains hidden, being unable to see well in the light, but at night is actively engaged in search of its prey—rats, mice, moles, rabbits, and young hares, sometimes also pigeons, and even fish.

The *Knocking Owl* (*S. Pulsatrix*) is about seventeen and a half inches long; head rather larger than in the Tawny Owl; wings not quite reaching the end of the tail; legs strong, stout, and feathered nearly to the claws. This is a very beautiful bird. Native of the Brazils.

The *Pagoda Owl* (*S. Pagodarum*), seventeen inches long, is found at Pondicherry, where it is called *Oumé-Kolan*.

The *Little Owl* (*S. Passerina*) is about nine inches in length, and the size of a Jay; it is the smallest European species; cere olive-brown; beak much hooked, and rather curved at the sides. It is common in almost all the warmer countries of Europe, but rarely higher than 55° of north latitude: in England it is only an occasional visitant.

Tengmalm's Owl (*S. Tengmalmi*) is rather smaller than *S. Passerina*, with which it is often confounded, but may be distinguished, according to Yarrell, by the thickness and more downy character of its plumage, and by the length and abundance of the feathers covering its short legs and toes. This species, of rare occurrence in England, is found throughout the north of Europe; it is very common in North America, where it is found in the woody country from the Great Slave Lake to the United States.

The *Acadian*, *Ferruginous*, *Least*, *Occipital*, *Sonnerat's*, *Chestnut-winged*, *Collared*, *Many-rayed*, *Cayenne*, *White-fronted*, *White-banded*, *Mauge's*, *Cuckoo*, *Boobock*, and the *Spotted Owl*, together with *S. Passerinoides*, *S. Hylophila*, and *S. Brama*, are of this division.

The four following species, which have the beak curved only at the tip, and the facial disc very fully developed, form the genus *Strix*, or *True Owls* of Savigny.

The *Barn Owl* (*S. Flammea*). Thirteen inches in length; beak straw-coloured, lengthy; curving at the tip; irides yellow; face and throat white; upper parts light ochreous-yellow varied with grey and brown zigzags. (Plate 3.) Legs and toes covered with very short down, but thin upon the toes; claws yellowish-white, the middle one having its inner

edge imperfectly serrated. This is the most common species in this country, is widely spread throughout Europe, Asia, and less frequently in the northern parts of America; it lives among old ruins, barns, church-towers, and other secluded places, where it breeds, making its nest under the eaves of buildings or in the hollows of trees, and lays three or five whitish eggs. About twilight it leaves its retreat, and may be seen hunting noiselessly and regularly over the fields and along the hedgerows in search of mice, shrews, bats, and beetles, upon which it drops with great precision and swallows whole. Occasionally in its flight it utters loud screams, whence its vulgar name of *Screech Owl*, and if disturbed when perched, hisses and snores very violently. The *S. Javanica* of Gmelin is merely a variety of this species.

The *Pearly Owl* (*S. Perlata*) very nearly resembles the preceding, and is considered both by Wilson and Temminck as identical with it. Lichtenstein, however, considers it a distinct species. It is spread throughout the greater part of South America.

The *Chestnut Owl* of Java, the *Fork-tailed Owl* of Mexico, and Say's *Burrowing Owl* of Missouri, are also species of this section.

Second Section.—*EARED OWLS*. This division is easily distinguished from the former, by a pair of little tufts of feathers placed more or less forward upon the forehead, and which are generally, but not always, capable of erection, and are known by the several names, *horns*, *ears*, or *aigrettes*. They are further divided into two minor sections.

First: *Eagle Owls*. Tail rounded and longer than the wings; legs and toes feathered to the long, curved, and very sharp claws; facial disc almost imperceptible; aural conch small, oval, and without an opercule. They form Cuvier's genus *Bubo*; are very strong and active; do not wait till darkness sets in, but are often seen prowling about before sunset, and in the high northern latitudes are constantly on the wing in daytime during the summer months, for which their bright yellow irides seem to fit them.

Species—the *Great-horned* or *Eagle Owl* (*S. Bubo*): two feet in length. Very common in the great forests of Hungary, Russia, Germany, and Switzerland, but rare in France and England, and never in Holland. It is also found in North America, Kamtschatka, and China, and often, according to Temminck, at the Cape of Good Hope.

The *American Great-horned Owl* (*S. Virginiana*): the male twenty, and the female twenty-four inches in length; the *White-horned Owl* (*S. Arctica*), twenty-three and a half inches in length; very similar to *S. Virginiana*; the *Bengal Eared Owl* (*S. Bengalensis*); the *Sultan Owl* (*S. Sultanus*); the *Supercilious Owl* (*S. Griseata*), native of Cayenne; the *Noisy Owl* (*S. Strepitans*), native of Sumatra; also the *Sumatran Owl* (*S. Sumatrana*).

Second: *Eared Owls*. Tail square, and scarcely showing any concavity beneath; wings long; the legs and toes feathered to the claws, which are long and very sharp; facial disc of moderate size, and complete; conch extending from the beak to the top of the skull in a semicircular form, and provided with an opercule. They form the subgenus *Otus* of Cuvier, are generally nocturnal, and prey upon mice and small birds; some live in the woods, and others in more open country, or on heaths.

The *Eastern Great Horned Owl* (*S. Ascalaphus*) is seventeen and a half inches in length: is found in Africa, and common in Egypt.

The *Long-eared Owl* (*S. Otus*), fourteen inches in length; aigrettes consisting of eight or ten feathers, black, edged with yellow and white, and about an inch and a quarter long; beak black; irides deep orange; upper parts ferruginous-yellow, irregularly spotted with deep brown and ashy-grey; under parts pale ochrish-yellow, marked with oblong blackish-brown streaks. The female is distinguished by her white throat and face, but the edges of the latter marked with brown, and the plumage generally mottled with greyish-white. It is found in Europe, Africa, and America, and is common in the wooded parts of this country, France, and Germany, preferring, however, pine plantations and old ivy. This species does not build any nest, but occupies those deserted by crows, magpies, wood-pigeons, or squirrels, and lays four or five white eggs with rounded ends early in the spring. They feed principally on mice and moles, but occasionally on small birds, which they surprise at roost. They are courageous

birds, and if attacked, throw themselves upon their back, fight boldly with their beak and claws, and at the same time hiss furiously. (Plate 3.)

Other species—the *Short-eared Owl* (*S. Brachyotus*), from twelve to fourteen inches long; the *African Spotted Owl*, sixteen inches in length; the *Large-beaked Owl* (*S. Macrorhyncha*), nineteen inches long; the *Yellow-cheeked Owl* (*S. Wilsonianus*); the *White-cheeked Owl* (*S. Leucotis*), ten inches long; the *Mottled Owl* (*S. Asio*), ten inches long; the *Milky Owl* (*S. Lactea*), and about twelve additional species.

ORDER II.—PASSERINA. PERCHERS.

THE Birds composing this Order are very miscellaneous; for they consist of all those which have not the decided characteristics and habits of the Poultry, Birds of Prey, Climbers, Waders, and Swimmers. They are not restricted to one kind of food, for some feed on insects, some on fruits, and some on grain; nor do they possess the same powers of flight in common. Among them the singing birds are found. This order is the most numerous of all the orders of the class Aves.

Family—TOOTH-BILLED; *Dentirostrata*.

The greater number of birds in this family feed on insects; their upper mandible is notched, and their beaks are stout and compressed.

ILLUSTRATIVE EXAMPLES.

PLATE 4.

Genera.	Species.	Common Name.
Lanius - - -	Excubitor - - -	{ Great Cinereous Shrike or Butcher Bird.
Muscicapa - - -	Grisola - - -	Spotted Flycatcher.
Tanagra - - -	Vittata - - -	Banded Tanager.
Turdus - - -	Polyglottus - - -	Mocking Bird.
Rupicola - - -	Aurantia - - -	Orange Rock-cock.
Eurylaimus - - -	Javanicus.	

Other Genera of this Family:—*Edolius*, *Malurus*, *Meliphaga*, *Menura*, *Motacilla*, *Muscipeta*, *Myothera*, *Ocypterus*, *Oriolus*, *Pardalotus*, *Pastor*, *Phibalura*, *Phyllornis*, *Pipra*, *Pitta*, *Platyrhynchus*, *Procnias*, *Ptilonorhynchus*, *Pyrrhocorax*, *Saxicola*, *Sparactes*, *Sylvia*, *Thamnophilus*, *Timalia*, *Trichophorus*, *Tyrannus*, *Vanga*.

CHARACTERS OF THE GENERA.

1. LANIUS (Lat. *lanio*, I tear). Beak of moderate size, strong, compressed, straight; upper mandible curved; nostrils round, lateral, and basal; tarsus longer than the middle toe; three toes in front, and one behind; wings of moderate length.

2. MUSCICAPA (Lat. *Musca*, a fly, and *cappio*, I take). Beak of moderate size, strong, angular, depressed at the base, tip curved, deeply toothed; nostrils ovoid, basal, lateral; tarsi rather longer than the middle toe; three toes in front, the outer connected at its base with the middle, and one toe behind.

3. TANAGRA. Beak conical, short and strong, trigonal at the base, ridge curved, tip hooked down, toothed, and much longer than the lower mandible, which is straight; wings rather short; tarsus as long as the middle toe, at the base of which the outer is connected but the inner is free.

4. TURDUS. Beak sharp, tip pointed and curved, the upper mandible toothed towards its extremity; tarsus longer than the middle toe, which is attached at its base to the outer; hind toe large; claws large, but only slightly curved.

5. RUPICOLA (Lat. *rupis*, a rock, and *colo*, I inhabit). Beak stout, slightly vaulted, curved at the point, and toothed; base of the bill as broad as its depth; lower mandible straight, toothed and pointed; nostrils basal, lateral, ovoid, partially open; wings of moderate size; tarsus as long as the middle toe, and partially feathered; inner connected to the middle toe beyond the second joint, but the outer only at its root; hind toe very strong, and armed with a stout claw.

6. EURYLAIMUS. Bill broader than the head; under mandible thin; nostrils basal, transverse, oval; wings and tail rounded.

The characteristics of the "other genera" partake, more or less, of those already given: their number precludes our inserting them at length.

DENTIROSTRATA.—DESCRIPTION OF THE SPECIES.

LANIUS—*Shrike*. The Shrikes are commonly found in all parts of the world, except in South America, where they are replaced by the genera *Vanga* and *Thamnophilus*, one single species only, the *L. Collurio*, being met with there. They are powerful and cruel, the larger species carrying off young birds in their beak, transfixing them on a thorn, and tearing them to pieces before they eat them: the common food of the genus, however, is beetles, small lizards, and other reptiles. They are very bold, and defend themselves courageously if attacked by larger birds. Their flight is precipitate, but irregular, and in their course they describe a low kind of curve, and continually move their tail. They are generally, but not always, gregarious, and build in the woods and hedges, laying five or six eggs. Their natural cry is very shrill; but they seem to possess in many instances the power of imitating the note of other birds.

The *Great Cinereous Shrike* (*L. Excubitor*)—Plate 4—is about the size of a Thrush, bill black, head, neck, and back light ash-coloured; under parts white; wings short and black; legs black. This species is common in Europe, and often found in England; it feeds on Shrew-mice, Frogs, and small birds, which it spits on a thorn, and tears to pieces; hence its vulgar name *Butcher Bird*, by which it is known in the north of England. In Germany it is called the *Wurch-angel*, or Suffocating Angel, from its strangling the birds on which it feeds before tearing them to pieces.

The Shrike family include thirty-two principal species, the general characteristics and habits of which are alike.

MUSCICAPA—*Flycatcher*. A large proportion of the birds forming this genus belong to warm climates, and exhibit great variation in the form of their beak, dependent on the different kinds of insects upon which they feed. In their habits the Flycatchers approach the Shrikes, being of a quarrelsome and spiteful disposition, driving away from their haunts all other insectivorous birds, and even chasing each other. They feed on flies and other winged insects, which they take on the wing, but never on the ground, and rarely even on the leaves of trees. In Europe, for the most part, they live alone in the forests, upon the tops of the trees, and lay but once a year.

They have been divided into geographical sections:—European, Asiatic, African, American, and Oceanic Flycatchers.

The *Spotted Flycatcher* (*M. Grisola*)—Plate 4—is one of the European species. It is rather larger than the common Sparrow; the upper parts ashy-brown; throat and middle of the belly white; sides of the neck, chest, and belly marked with longitudinal ashy-brown streaks. The Spotted Flycatcher makes its appearance in England and France in the spring, and leaves us about September, when the dipterous insects on which it feeds become scarce. It is of a dull aspect, and naturally fierce; never sings, but utters a piercing, disagreeable cry. It lives in the woods, and builds its nest of moss, wool, or hairs, intermingled with roots, in the hollows of rotten trees, and sometimes in holes of walls, or even in bushes, and lays five or six eggs, bluish white spotted with rust colour.

The *White-collared Flycatcher* (*M. Albicollis*), the *Little Flycatcher* (*M. Parva*), and the *Pied Flycatcher* (*M. Luctuosa*), are of this division.

The Asiatic species are about sixteen in number; the African ten; the American fifteen; and the Oceanic about twelve.

TANAGRA. This extensive genus is entirely confined to America, and, according to Temminck's and Prince Maximilian's observations, gradually approach in form to the Grosbeaks, Shrikes, Flycatchers, Finches, and Pies. They are birds of very beautiful colours, varying in size from that of a Finch to that of a Starling. Some live in the thick woods, others in open country studded with copses, and some especially prefer the bushes on the banks of rivers or on the sea-coast. They are as various in their disposition; some are lively and active, others quiet and phlegmatic. They

live sometimes in flocks, at other times singly or in pairs, and often sit quietly upon the lower branches of underwood. They feed on berries, seeds, fruits, and also on insects. Like most other of the bright-coloured birds of tropical climates they have generally little or no voice beyond their common call.

They have been divided into the *Bullfinch Tanagers*, the *True Tanagers*, the *Jacapa Tanagers*, the *Thick-beaked Tanagers*, the *Shrike Tanagers*, and the *Tachyphonus*.

The Bullfinch Tanagers, though called *Euphonus*, utter but a short call. There are six principal species.

The True Tanagers embrace about thirty-four species, of which the *Filleted or Banded Tanager* (*T. Vittata*) is one. It is five and a half inches in length; beak black; head, nape, and upper part of the wings azure-blue; back deep violet-blue; wings and tail bluish-black edged with light blue; throat yellowish-white; other under parts rust-coloured; legs brown. The female is distinguished by the greenish-brown cast of the upper parts of the body, and by the absence of blue except above the eyes and at the flexure of the wings. Is a native of Brazil.

The Jacapa Tanagers include three species; the Thick-beaked Tanagers six; the Shrike Tanagers also six; and the Tachyphonus four.

TURDUS—Thrush. All the species are of moderate size, prettily formed, and in the shape of their beak approach the Crows. The inner sharp edges of the eyelids and the corners of the mouth are, in all the species, yellow at pairing time. Buffon has divided them into Thrushes and Blackbirds. They mostly live in flocks, and have a sameness of voice. But few are stationary in any country, the greater number migrating northwards in summer, and returning to the south in winter. They feed on insects, worms, and berries; the tough wing-cases of the former, and the shells and stones of the latter, they reject from their gizzards in the shape of oblong pellets. They all hop, and never walk. Some prefer the woods and other rocky places. They are divided into three sections:—Wood Thrushes, Mocking Birds, and Rock Thrushes.

The *Wood Thrushes* live in companies, and specially at their migratory seasons. They constantly inhabit woods, bushes, and gardens, are very similar in their habits and in their voice, are very amorous, and one species readily follows the call of another. They build nicely-contrived nests, breed twice a year, and their eggs are mostly pale sea-green.

The principal species number about seventeen, in which the Thrush and Blackbird are included.

The call of the *Thrush*, or *Song Thrush* (*T. Musicus*), is a hissing or hoarsely-piped *zipp*, uttered often so low as to lead to the supposition that the bird is far distant, although close at hand. When alarmed or uneasy, their note, *dak, dak, dak, dak, dak*, is uttered in a higher tone; and at sunrise and sunset, and often even later, when they resort to the water to drink and bathe, the first which finds a suitable stream utters joyfully *tic, tic, tic, ticki, dack, dak*, and this being quickly responded to by the party, consisting of ten or twelve, they cautiously begin to enter the water, and so soon as one has ventured in, the rest quickly follow, and begin to quarrel if they are scant of room. If disturbed whilst in a bush, it darts out, merely uttering *zipp*, or *dack, dack*, by which it is distinguished from the Blackbird. The male has a very beautiful song, which from March till far into summer is heard in the woods, specially at morning and evening; it sits singing on the very topmost branch of the tree, above its usual favourite perch. Previous to having young ones they sing during the day, but most beautifully towards evening, and continue till twilight has passed, after which they descend, but for a long while their beautiful *tir, tir, tir, tir*, may be heard. Their song has some resemblance to that of the Blackbird, but the tone is higher, the time quicker, the pauses between the strophes shorter, but the entire song longer, more melodious and varying, and has several distinct, very flute-like strophes, of which some resemble the syllables *tratu, trati, migam, migam*, and *kudubh, kudiet*, each twice repeated.

The Song Thrushes build in trees of no great height; often in apple and pear trees. The nest is pretty large, in which are laid from four to

six eggs of a bright sea-green colour, with many small, and a few large, round, light rufous-brown spots; sometimes there are only a very few and small spots, and sometimes the eggs are spotless.

The call of the *Blackbird* (*T. Merula*), uttered either whilst sitting or flying, is a tremulous *tsrii, tsritsrii*; but sometimes merely *tak, tak*, or, in a deeper tone, *tuk, tuk*, and, if very earnest, *taktaktaktak*, expressive of pleasure, or of the approach of something which they fear to be dangerous; and should this draw nearer, their voice changes to *tir, tir, tir, tir, tir, tir!* very loudly uttered, and, when they take wing, followed by a shrill, quick *gaig iggig giggi, gaigig giggiggi*. In the evening, when sitting on a low branch, or flying to the water, they utter the syllable *tir*, sustaining it for a minute. If suddenly frightened, they dart off, crying out in a loud tone *tak, tak, gaigig, giggiggi, tak, tak*, the middle syllables expressed very quickly. The male Blackbird is one of our most beautiful songsters; his song consists of many strophes following at short intervals, among which are some more staid chirping and hoarse notes, varied with clear whistles; but it is specially distinguished and heard at a great distance, by a loud flute-like *tratu, tratatue*, which has also been compared to the sounds *david, hans david*. With this somewhat melancholy song they enliven the quiet evenings of the early spring; they sing also during the day, but specially at morning dawn; for the most part, however, their song is first continuous towards evening, in the twilight, till the night is completely set in, when they cease, or are only very rarely heard. From March to July they sing incessantly, but principally on the evenings of hot and sultry days. Blackbirds build in the woods where thickest, and in the neighbourhood of water, making their nest sometimes in a hollow tree, but if more exposed, upon a small branch or in a thick bush. The female lays four, five, or six eggs, of a greenish-grey colour, marked with pale-brown spots.

The *Mocking Birds* are all natives of America, and frequent the lower brushwood near the ground, mounting higher only during spring and breeding-time, when they sing to their mates. Their note is very loud; some possess great melody, but in others it is very harsh, grating, and kept up incessantly.

The species figured on Plate 4 (*T. Polyglottus*) is known as the *Singing Bird*, *Nightingale*, or *Mocking Bird*. It is about nine and a half inches long; bill black; upper parts dark-brownish ash; sides of the neck, breast, belly, and vent brownish-white; wings and tail nearly black; tail cuneiform, the outer two quills white, the others only tipped with white. The female lays four or five cinereous blue eggs with large brown blotchings. During the period of incubation, which lasts about fourteen days, neither man nor brute is allowed to approach without being fiercely attacked. But its vengeance is specially directed against the black snake, the inveterate spoiler of its eggs and young, and so soon as its stealthy approaches are noticed, the male darts at it like an arrow, striking it violently about the head with its beak, and as the snake's strength fails, the Mocking Bird seizes, and lifting it up a little from the ground, beats it with its wings until it has destroyed it. The motions of this bird are easy, elegant, and rapid; its voice full, strong, and musical, and capable, as Wilson observes, of almost every modulation, from the clear mellow tones of the Wood Thrush to the savage screams of the Bald Eagle. Its own note is bold, full, and varied almost endlessly, consisting of short expressions of two, three, or at most five or six syllables, generally interspersed with imitations, all uttered with great emphasis and rapidity, and continued for half an hour or an hour. As his song swells or dies away he mounts and descends, or, as Bartram expresses it, "he bounds aloft with the celerity of an arrow, as if to recover or recall his very soul, expired in the last elevated strain." His imitations are so perfect, that he not only deceives the sportsman, sending him in search of birds perhaps many miles distant, but even birds themselves are often deceived by his voice, and are either enticed by the fancied calls of their mates, or scared away by the well-feigned screams of the Sparrow Hawk.

Besides the Mocking Bird there are five other species.

The *Rock Thrushes* are readily distinguished by the rufous colour of the caudal quills, excepting the middle two, which are black. They live soli-

tarily, and always inhabit steep rocks and the stony parts of the highest mountains, among the clefts of which they build. They feed almost entirely on insects.

There are two species, natives of Italy, Switzerland, Hungary, France, Spain, and Turkey.

RUPICOLA—*Rock-cock*. There are three species, two of which are natives of America, but the third is found in Asia. They are granivorous.

The *Orange Rock-cock* (*R. Aurantiaca*) is rather larger than a Wood Pigeon: general colour of the plumage orange, which becomes more brilliant as the bird increases in age. The female is distinguished from the male by her plumage being brown. The young male does not assume his bright plumage at first, but has the brown colour of the female; and at each moult more orange is thrown out till it assumes at last the colours described as those of the adult. It is a native of Guiana, and lives in the deep clefts of rocks and in caverns.

The *Peruvian* and *Green Rock Cocks* are the other species.

EURLAIMUS. The *Javanese Eurlaimus* (Plate 4) frequents the most remote and inaccessible wastes, covered with forests and abounding with rivers and marshes. It builds its nest pendent from the branch of a tree overhanging the water. Its general colour is purple; forehead black; back of neck and wings dark brown; bill variegated and striped; tail-coverts tipped with yellow; tarsi dusky-yellow. Native of Java, Sumatra, and the Indian Archipelago.

EDOLIUS. Found in the countries bordering the Indian seas, also in Africa. They are about the size of our Thrush; colour black or dark-brown. The Hottentots call them *Duywels*, or Devil's Bird, from their cry *pie-griach-griach*.

MALURUS—*Merion*. These birds are divided into two geographical sections—the African, and those of the Indian Archipelago and New Holland. They are found in marshy districts covered with high grass and reeds; they are very swift, and run more than fly. One species, the *Soft-tailed Merion* (*M. Malachurus*), is called by the colonists of Port Jackson the Emen Bird.

MELIPHAGA—*Honey-eater*. The birds of this genus are found only in the South Sea Islands and the distant parts of India. Species about eighteen.

MENURA. The species (*M. Superba*), the *Superb Menura*, is about the size of a hen pheasant; its general colour is brown; prefers retired districts; and is remarkable for the lyre-like form of its tail. A native of New Holland. Is called by the colonists the Wood Pheasant.

MOTACILLA—*Wagtail*. They live on the banks of rivers or in watery meadows among the cattle, running round them, for the purpose of catching the flies which settle about their legs, and perhaps also the larvæ disturbed by their steps, for which purpose they not unfrequently follow the plough; they are extremely active, and continually elevating and depressing their tails; whence has arisen their common appellation. They appear to be connected with Wading-birds by the length of their legs, and by their long scapulars, which when the wings are folded cover their tips.

The *Grey Wagtail* (*M. Boarula*) remains in England through the winter, and is found throughout Europe, especially in the north.

MUSCIPETA—*Flyseeker*. The birds forming this genus are generally of slender make, and therefore only capable of catching insects. Some are furnished with crests on the head, or long feathers in the tail, and some have a remarkable membranous circlet about the eyes. They are classed geographically: the Asiatic eight species; the African two; the American twenty-two; and the Oceanic ten or eleven.

MYOTHERA—*Palikour*. The latter is the common title by which these birds go in Guiana; do not fly much on account of the shortness of their wings, but they run or hop along the trees with great quickness. They are found in South America and in Java, in the depths of retired woods in the neighbourhood of large ant-hills, on whose tenants they principally feed. General colour of the upper parts brown, grey or whitish beneath.

OCYPTERUS—*Swallow-shrike*. Six species, resembling the Shrikes in

conrage and the Swallows in their length of wing and rapidity of flight. Plumage varied black and white. Inhabitants of the East Indian isles and Australia. They feed on insects.

ORIOLES—*Oriole*. They differ from the Thrushes in the greater strength of their beak and shortness of their tarsi; plumage black and yellow. One species, the *Witwall* (*O. Catbula*), is European, rare in England; and seven species are found in New Holland and the East Indian isles.

PARDALOTUS. This genus is closely allied to the *Pipræ*, or Manakins, from which it is distinguished by a dilated instead of a trigonal base. There are seven species, some of which are inhabitants of South America, some of New Holland, and some of Java.

PASTOR—*Locust-eater*. The name of this genus refers to their habit of flocking together in large parties. Vieillot named the genus *Acridotheres*, from the Grasshoppers on which they principally feed. All of them belong to the old world, collect together, and live in large flights, like Starlings, which they closely resemble in habits; they are very fond of being among cattle, on the backs of which they alight for the purpose of picking out the ticks and other vermin; are often seen on dunghills, and also feed upon large insects, especially locusts.

The number of species is eight, only one of which has occasionally visited England.

PHIBALURA. This genus, of which there is but one species, is connected with the *Pipræ*, by the form of its legs and beak and the distribution of its plumage. From the Brazils.

PHYLLORNIS—*Leaf-Bird*. There are four species, common in Java, Sumatra, and Borneo. Their size varies from five to seven inches; general colour green, tinged with brilliant yellow or marigold colour. Habits not well known.

PIPRÆ—*Manakin*. All natives of South America. They live on the borders of woods, and feed on insects.

PITTA. All tropical birds, exactly agreeing in their form and habits, whether found in the new or old world. They are insect-eaters.

PLATYRHYNCHOS—*Broad-beaks*. Natives of Brazil: they have a pleasing note, and feed on winged insects.

PROCNAS. Similar to Swallows; natives of tropical climes.

PTILONORHYNCHUS. Only two species; inhabitants of the South Sea Islands.

PYRRHOCORAX. A genus similar in size to Crows; found in Italy, Switzerland, and Egypt.

SAXICOLA—*Wheatear*. The *Saxicolæ*, by the breadth of the base of their beak, are connected with the true Flycatchers, *Muscicapæ*, and by their habits an almost direct passage to that section of the Thrushes, *Turdi*, which live among the rocks. They are all found in the old world, are shy, living only in pairs upon open moors, or in rocky districts, where, on the least alarm, they hide either behind stones or in holes. The great length of their legs renders them good runners, and they feed upon insects and worms, which they catch upon the ground with great activity. In Great Britain three species are found, but two of these are migratory; and, though generally they are found in the southern parts of Europe, and in that part of Africa which borders or is near to the Mediterranean, yet some species are found constantly remaining in high northern latitudes.

SPARACTES—*Butcher*. One species only known; size of a Blackbird.

SYLVIA—*Warbler*. The Warblers form a most extensive genus: in Latham's arrangement two hundred and ninety-eight species were included. They are spread over most parts of the world, and most of those found in England are migratory, making their appearance in spring and leaving in autumn. Several of them, especially those living in the woods, are the finest songsters; but their song does not last throughout the whole of their visit, and is almost entirely at an end or materially altered after breeding-time has ceased. The greater number are constant inhabitants of warm climates, and breed twice a year, which some few species also do in this country. The males generally have their colours brighter than the females, but the colours themselves are the same; and in those which live among marshes there is not any difference between the sexes even in that respect. They

feed upon worms and winged insects, which they do not take on the wing, but hunt from rush to rush or from branch to branch.

The *Sedge Warbler* (*S. Phragmitis*) is one of the species known in England: it frequents rivers and lakes where reeds and other water plants abound. It comes to this country in April and stays till September. It builds its nest sometimes amongst reeds, sometimes among rushes, and at other times in hedge-bottoms. It lays four or five eggs of a pale wood-brown colour, speckled all over with the same colour, but of deeper tinge. It is almost constantly singing both day and night, may be heard at a great distance commencing its song with *chit, chit, chiddy chiddy chiddy, chit, chit, chit*; and if silent may be roused to sing by throwing a stone into the bush where it has hidden itself. It is a very abundant species, and feeds on aquatic insects, dragon-flies, slugs, and worms.

The *Nightingale* (*S. Luscinia*) is common in the southern, eastern, and midland counties of England, rarely in the northern and western: it usually arrives about the end of April or beginning of May, and has been frequently heard annually on the very same day in some districts. The male precedes the female by about ten days—a circumstance which Selby states is common to most other summer visitants, and during that time sings throughout the whole night for the purpose of attracting its mate; but when this is effected, the nocturnal music is hushed, to be resumed, however, with the earliest dawn, and continued throughout the day.

Bechstein, in his interesting and clever work on the "Natural History of Cage Birds," states, that he has distinguished twenty-four different strains, without including its little delicate variations, in the song of a fine Nightingale, and that it is so articulate, so speaking, that it may be very well expressed in writing. Nightingales frequent shady, cool, but not cold districts, woods, plantations, and even hedge-rows, where the underwood is thick and close to the ground; but they do not prefer watery places, and if found there, Bechstein says, it is on account of the thickets, and not for the water. Here they build low, sometimes even on the ground, and among the roots of trees where the grass and bushes are thick. The foundation consists of loose herbage, rushes, and dry leaves, but the nest itself is compactly formed of leaves, specially those of the oak, rushes and grass matted together, and thinly lined with fine grass. In it are deposited, towards the latter end of May, four, five, and sometimes six eggs, commonly pure drab, but occasionally speckled, which are hatched in about a fortnight. The young are fed with green caterpillars, probably the larvæ of some moth, or perhaps of a *Tenthredo* peculiar to certain localities.

So soon as the young birds are hatched, the song of the parent bird becomes more and more rare, and after Midsummer ceases, and instead of its melodious strains nothing now is heard beyond a single low croaking note, to give warning of danger, or occasionally a sharp snapping noise made with the beak, and held to be a note of defiance. The young, however, now begin to warble and attempt to imitate the parent song. They leave this country in September, and even the southern parts of Italy not later than the latter end of that month or the beginning of October, and pass over to Northern Africa, Egypt, and Syria, where they winter.

The *Black Cap* (*S. Atricapilla*) arrives in England about the middle of April, and sometimes earlier, but never till the larch trees are distinctly green. The male rivals the Nightingale in its song, which is full, deep, sweet, and loud, and, though it has less volume, strength, and expression, is more pure, easy, and flute-like in its tones. The female also sings, but her song very much resembles that of the Redbreast. The call is a kind of *tack*, quickly and frequently repeated; and when alarmed it utters a hoarse disagreeable noise, similar to that made by a Cat when hurt.

The *White Throat* (*S. Cinerea*) is generally spread over Europe; it comes here about the middle of April, and is seen fluttering about among the bushes in fields, among brambles, thickets, the underwoods of low mountains, among weeds and nettles, whence one of its provincial names is the *Nettle Creeper*, and also in orchards. They leave us about the latter end of September. It is a lively, active bird, constantly in motion, and singing with all its power often far into the night: its song consists of several strains rapidly succeeding each other, sometimes in soft, low tones,

occasionally broken in upon by louder and shriller notes, which are rather harsh.

The *Lesser White Throat* (*S. Curruca*) is common in the neighbourhood of London, but is rare in Cornwall; is found also as high as Durham, but becomes rare in Northumberland, and a few are found in Scotland. It is very shy, and inhabits the thickest hedges.

The *Dartford Warbler* (*S. Provincialis*) is found, in England, most abundant in Devonshire and Cornwall, and also about Oakingham in Berkshire, and is not unfrequent on the heathy commons near London. It lives on open downs and commons contiguous to thick furze, in which it finds the most secure shelter when alarmed, creeping from bush to bush with great alacrity, and hiding itself in the thickest part. Its cry resembles *cha, cha, cha*.

The *Robin* (*S. Rubecula*) seems to be strictly indigenous to Europe. They live in pairs, but are otherwise unsociable and quarrelsome, two seldom being found in the same garden, as they fight till the weaker is driven away. The female lays from four to seven eggs, yellowish-white, with wavy spots and streaks of brown. The Robin sings throughout the year; most melodiously and brilliantly in spring, but in autumn and winter it is little more than a mere warble. It has different cries, one of which, *tirit, tirit, tirit*, is heard morning and evening, or when the bird is excited by any novel object; another, *nip, nip*, seems to be its call, for Vieillot says it only needs to imitate this whilst sucking the finger to rouse all the Robins in the neighbourhood. It is constantly in motion, and after every hop utters the syllables *sisri*. The familiarity and confiding manners of this species have, in many countries, obtained for it endearing appellations; thus, whilst in England it is called *Robin Redbreast*, in Germany it is *Thomas Gierdet*, in Norway *Peter Ronsmad*, and in Sweden *Tomi Liden*.

The *Red Start* (*S. Phœnicurus*) is commonly spread over Europe, and is found in most of the eastern, midland, and northern parts of England. It comes to us early in April, and leaves about the latter end of September. It is very familiar, building its mossy nest, lined with hairs, in exposed situations in our gardens, in holes of walls and decayed trees, as if to court attention, and lays from five to eight very pointed greenish-blue eggs.

The *Wood Wren* (*S. Sibilatrix*) is common throughout the greatest part of Europe, lives in forests, especially beech woods, and utters its cry *s, s, s, r, r, r, r, fid, fid, fid*, whilst fluttering and beating its wings. It makes its nest in the hollows of trees, or among their roots, but often builds on the ground in form of a little tower, concealing its nest, which is made of moss and lined with fine grass and hair, under those trees which have the thickest foliage. It lays six eggs, white with reddish spots, which form a circle around the broad end.

The *Yellow Wren* (*S. Trochilus*) arrives in this country about April, or later if the weather be severe. It has a simple song, consisting of a few prolonged and softly-modulated notes, which it sings whilst actively employed in search of aphides and other insects.

THAMNOPHILUS—*Batara*, or *Bush Shrike*. Nine American species; four or five African. They feed on caterpillars, and are quiet and solitary.

TIMALIA. Approximates to the Thrush genus: two species are found in Java and Sumatra; one of which has a peculiar and pleasing note, consisting of the five tones of the diatonic scale, C D E F G, slowly repeated, to which it adds sometimes a sixth.

TRICHOPIORUS—*Bristle Neck*. This genus approaches the Ocypteri; three species natives of Africa.

TYRANNUS—*Tyrant*. The Tyrants, which are all natives of America, are fierce, courageous, and active, feed on insects generally, some species also on dead carcases, according to Azara, and some fish like King-fishers, and eat Lizards, as noticed by Swainson. Usually they sit perched upon a twig, and dart upon such insects as come within their notice; but some chase their prey upon the ground. Most of the species live either in or upon the borders of woods or thickets, but occasionally some are found on the edges of streams.

VANGA—*Rainbird*. Two species found in the East Indies and New Holland.

Family—WIDE-MOUTHED; *Fissirostrata*.

The beak is adapted for catching insects: it is short, broad, and deeply cleft. They are birds of passage, and their food consists chiefly of insects.

ILLUSTRATIVE EXAMPLES.

PLATE 5.

Genera.	Species.	Common Name.
Hirundo - - -	{ Rustica - - -	Chimney Swallow.
	{ Urbica - - -	House Martin.
	{ Esculenta - - -	Esculent Swallow.
Cypselus - - -	Murarius - - -	Black Swift.
Caprimulgus - - -	{ Europæus - - -	European Goat-sucker.
	{ Macrodipterus - - -	Leona Goat-sucker.

Another Genus is Podargus.

CHARACTERS OF THE GENERA.

1. **HIRUNDO.** Beak short, triangular, depressed, widely expanded at the base, but compressed at the point; the upper mandible slightly hooked downwards, lower straight; gape very wide, and reaching almost to the eyes; *vibrissæ* short and few; nostrils at the root of the beak, oblong, partly covered by membrane; wings long; tail sometimes square, sometimes forked; legs short and slender; toes three in front and one behind, the outer front toe united by membrane to the middle as far as the first joint.

2. **CYPSELUS.** Wings long and narrow; tail, consisting of ten feathers, forked in some, nearly even in others; legs thickly feathered; feet short; four toes pointing forward; claws strong and curved; middle and outer toes three phalanges each.

3. **CAPRIMULGUS.** Beak short, but broad at its base, and often furnished with bristles; gape wide; wings long; tail generally square; legs short, with three toes connected at their base by membranes, and a toe behind.

4. **PODARGUS.** See under "Description of Species."

FISSIROSTRATA.—DESCRIPTION OF THE SPECIES.

HIRUNDO. Swallows are exceedingly active, being almost invariably on the wing in search of insects, on which they feed whilst flying, and for this purpose their wide mouth, which is continually open, admirably adapts them; their motions are extremely rapid; turning short round upon their prey with great quickness, they seize it so sharply that the snapping of their beak makes a loud click. They are generally observed skimming along the surface of water in search of their prey, which consists principally of gnats, especially when they have young ones; but when their breeding time is over, they feed also on small *scarabæi*. As they dart along the water, they may often be noticed dipping in their beaks to drink, and dashing their breasts against it to bathe, and refresh themselves. The quickness of their flight is very great. Spallanzani observes, that a pair of Swallows flew from Milan to Pavia, a distance of eighteen miles, in thirteen minutes.

Most of the Swallow kind build, about houses, nests composed of mud and straw, which, becoming hard, last for many years, and vary remarkably in the different species; some few bore holes in sand-banks, and, living them with hay and feathers, there nourish their young. During the winter the nests are deserted, but the same tenants invariably return to their old habitation in the spring.

Swallows generally breed twice in the summer, and occasionally a third time. Their latest brood is often destroyed by the cold weather setting in before they are strong enough to escape it.

Swallows, like many other animals, possess an *esprit de corps*, which induces them to flock together in order to repel a common enemy; such is the case when a Hawk is in sight, when they rise about him, as it were to make up for their weakness by endeavouring to intimidate him with numbers. They are also not slow to render assistance under other untoward circumstances, of which M. de Nemours in his "Mémoires" mentions a very interesting example: "A Martin was caught by the leg in a slip-knot

of packthread, of which the other end was fastened to a gutter of the *Collège des Quatre Nations* at Paris. At his cries all the Martins of the large basin between the Tuileries and the Pont Neuf assembled about him, and, after striking with their bills upon the packthread, succeeded in setting him at liberty."

Swallows do not remain with us all the year round; they are the harbingers of spring, and their departure indicates the approach of winter.

Swallows may be divided into Martins and True Swallows, the Martins having the legs covered with down, whilst in the True Swallows they are bare. The latter birds may also be divided into sections from the form of their tails.

Of the Martins there are three species—the *Window Swallow*, or *House Martin* (H. Urbica), shown on Plate 5, being the principal. It is about four and a half inches in length; the upper parts black, glossed with violet; the under parts white; wings, tail, and tail-coverts dusky brown, glossed with green on the edges; legs and feet scantily covered with brownish-grey down; beak black. The Martin arrives about the latter end of April, and builds its nest under the eaves of houses, and sometimes against the sides of high cliffs near the sea. The hen lays six round white eggs, which are hatched in about fifteen days; and there is usually a second, and sometimes a third brood. Whilst in the nest the parent birds, holding on by their claws, feed their young; which, when strong enough to fly, are fed whilst on the wing with a very quick motion, which is hardly discernible, unless the party watching be aware of the method.

Martins are chilly birds, and may be observed collecting early in the morning on the ridges of high houses facing towards the east, in order to warm themselves by the first rays of the sun. They have been observed in England as late as the middle of October, and even in November. As the time of their departure approaches, they collect in large flocks, which increase daily till they swarm "in myriads," as Mr. White says, "round the villages on the Thames, darkening the face of the sky, as they frequent the islets of that river, where they roost."

The *Chimney or Common Swallow* (H. Rustica), figured on Plate 5, is a species of the true Swallow. It is about six inches in length; it is distinguished from all the other Swallows by the remarkable forkiness of its tail, and the rusty red spot on the forehead and under the chin. The Swallow builds a hemicylindrical nest of clay, open at the top, and lines it within with feathers and soft grass; the old birds commonly build against the preceding year's nest, and in England most commonly in chimneys, whence is derived their trivial name; in Sweden they prefer barns, whence their name *Ladu Svala*, or Barn Swallows; but in other and hotter climates they choose galleries, porches, or open halls.

The Chimney Swallow appears in Europe about a fortnight before the Martin, and immediately resorts to the haunts of men: it breeds earlier than any other species, and lays about six eggs, white, marked with little red spots; but if the eggs be removed, it has been known to deposit as many as nineteen. They have usually two broods, the former hatched towards the latter end of June, and the latter about the middle of August.

The *Sand Swallow*, or *Shore Bird* (H. Riparia), lives in holes in sand-pits, in banks of rivers and cliffs, and sometimes of trees, boring some feet deep with its beak and claws, and lines its nest with straw and feathers. Although it does not arrive till after the Martin and Chimney Swallow, yet it brings out its young before that bird; and generally has two broods, one in June, the other in August.

The *Esculent Swallow* (H. Fuciphaga, or Esculenta) is about the size of the Sand Martin; the upper parts shining dusky black; under pale ash; tail black. They are found in the isles of the Indian Archipelago, and build in the hollows of the rocks, not only on the shore, but up the country. Their nests form a large article of commerce between the islanders and the Chinese, who highly esteem them as aphrodisiacs.

The True Swallows number about twenty-six species, of which the Chimney and Esculent Swallows are species.

CYPSELUS—*Swift*. The genus *Hirundo*, according to the arrangement of Linnæus, included not only the Swallows but also the Swifts, which

differ remarkably from them in having all four toes placed in front, instead of three before and one behind. In consequence of this circumstance, Illiger instituted for them the new genus *Cypselus*, to which Cuvier prefers the term *Apus*, including the same species.

The species *Cypselus Murarius*, or the *Black Swift* (Plate 5), is seen constantly on the wing except during the seasons of sleep and incubation. These birds pursue insects in flocks, sometimes mounting to a great height, and uttering discordant screams. They rest by clinging with their strong hooked claws to the surface of an old wall or rock, and they nestle in holes in steeples, or other lofty buildings, or in rocks. They arrive in this country in May, and depart about the end of August.

CAPRIMULGUS—*Moth-hunter*, or *Goatsucker*. These birds derive their name from an old notion, that they suck the teats of Cows and Goats, than which nothing can be more ridiculous, though it is believed by Buffon. They resemble the nocturnal birds of prey in the dark colour of their plumage; they live upon insects, which they catch with great dexterity, being furnished with a very glutinous saliva. They do not build nests, but lay their eggs, two in number, on the ground; are solitary birds, being rarely seen together, and live in retired situations. They do not make their appearance till twilight, and from their peculiar note may be easily discovered.

The *Night Jar*, or *European Goatsucker* (*C. Europæus*), is a beautiful bird, and the only one of the species native of Europe. It is about the size of a Cuckoo, and somewhat resembling it in plumage; its general colour is greyish-brown, spotted, and dashed with brownish-black. It visits us in the spring, and generally leaves about November. In Yorkshire it is known by the name of *Churn Owl*, in Shropshire by that of *Fern Owl*; and Charlton calls it the *Dorrahawk*, from its living very much on that insect. It is insectivorous; is fond of perching lengthways on trees, and lays two oblong oval eggs.

The *Leona Goatsucker* (*C. Macrodipterus*) is rather larger but very similar to the *C. Europæus*; it has the tail rounded; but it is very remarkable for a single feather twice the length of the body, which springs out of the middle of each wing-covert, and is not barbed but just at its extremity; on the inside the web is rather more than an inch in breadth, but on the outside not more than a quarter of an inch; its colour is the same as that of the body, and crossed with five dusky bars; legs small. Found in Sierra Leone.

There are seventeen other species; some found in America, some in Africa, and some in New Holland.

PODARGUS. Two species found in Java and New Holland. From the strength of their beak and nocturnal habits, they connect the Goatsuckers with the Owls.

Family—CONE-BEAKED; *Conirostrata*.

The beak of these Birds is strong, thick, and conical; it is adapted for the kind of food upon which most of them exclusively subsist, viz., seeds and grain.

Genera.	Species.	Common Name.
<i>Alauda</i> - - -	<i>Arvensis</i> - - -	Sky-lark.
<i>Parus</i> - - -	<i>Caudatus</i> - - -	Long-tailed Titmouse.
<i>Emberiza</i> - - -	<i>Hortulana</i> - - -	Ortolan.
<i>Fringilla</i> - - -	<i>Cælebs</i> - - -	Chaffinch.
<i>Loxia</i> - - -	<i>Curvirostra</i> - - -	Crossbill.
<i>Corythus</i> - - -	<i>Enucleator</i> - - -	Pine Grosbeak.
<i>Paradisea</i> - - -	<i>Apoda</i> - - -	Emerald Paradise Bird.

Other Genera of this Family:—*Buphaga*, *Cassicus*, *Colius*, *Coracias*, *Corvus*, *Glaucopsis*, *Gracula*, *Myophona*, *Phytotoma*, *Ploceus*, *Psittaciostro*, *Pyrhula*, *Sturnus*.

CHARACTERS OF THE GENERA.

1. **ALAUDA**. Beak short, straight, conical; mandibles of equal length; hinder toe and claw very long and nearly straight.

2. **PARUS**. Beak short, straight, conical, compressed, cutting, and pointed; nostrils basal, rounded, and hidden in feathers; legs strong, having three front and a hind toe perfectly distinct; the hind claw strongest and most curved.

3. **EMBERIZA**. Beak conical, short, and straight, with the edges of the upper mandible inclining inwards, and a hard prominence on the palate.

4. **FRINGILLA**. Beak short, thick, conical; upper mandible convex, and without crest or ridge; nostrils basal, round, open, and covered by the feathers of the forehead; tarsus shorter than the middle toe; hind toe as long as the inner, and its claw longer than those in front, curved, and rarely straight.

5. **LOXIA**. Beak strong, thick, compressed and curved; nostrils rounded, lateral, and near the root of the beak; feet having three divided toes before and one behind, the claw on the latter longer than the others, and curved.

6. **CORYTHUS**. Beak large; the point of the upper curved over the lower mandible.

7. **PARADISEA**. Beak straight, moderate sized, quadrangular, pointed, slightly arched; lower mandibles straight and pointed; nostrils basal, marginal, and open; legs strong; tarsus much longer than the middle toe, and the hind toe, which is strong, much longer than the others.

Only the generic characters of the illustrated examples are here given.

CONIROSTRATA.—DESCRIPTION OF THE SPECIES.

ALAUDA—*Lark*. There are about a dozen species of the Lark, of which the *Skylark* (*A. Arvensis*), and the *Woodlark* (*A. Arborea*), are of most interest to the inhabitants of this country.

The *Skylark* is so well known as scarcely to require description. The beautiful little songster measures about seven inches, of which the tail is three. It carries on its head a lengthened crest which it raises and depresses at pleasure; its plumage above is of a horny black, beneath it is whitish; irides greyish-brown; back of the head and neck whitish-grey, striped with dusky-brown; lower part of the neck, breast, and sides, dingy-white; wing-coverts greyish-brown; pinion-feathers dark brown; tail blackish-brown. The claws are long, especially the hinder claw, which unfits the bird for perching, but they enable it to walk upon the grass with ease, and to spring from the ground before the wings are expanded. The food of the Lark chiefly consists of insects, worms, seeds, and oats. It builds its nest on the ground, generally among long grass or young corn, in which the female lays four or five eggs of a greenish-grey hue, mottled with dark spots or dots. It is migratory, arriving in this country early in February, and taking its departure in October. It is spread very generally over Europe, and several parts of Asia and Africa.

The Lark sings occasionally while resting on a clog of earth, but generally whilst rising spirally from the ground into the clear blue sky; at which time the eye of the observer follows it with admiring interest till it is lost sight of except as a speck on the boundless expanse, the cheerful and animated song of the sweet-soaring bird—"the messenger of morn"—imparting, all the while, sensations of pleasure and calm delight.

The *Woodlark* is somewhat less than the former. Though its song is truly sweet, it is not quite so thrilling as that of the *Skylark*,—its notes are soft and plaintive; it frequents woodland, hilly districts, where it sometimes sings perched upon the branch of a decayed tree. Its song, however, is generally poured forth when on the wing, which is sustained, at times, for an hour without intermission. It builds its nest on the ground like the *Skylark*; its eggs are reddish-white, speckled with brown. The *Woodlark* is found in every part of Europe.

PARUS—*Titmouse*. These birds are found over the whole world, excepting in South America, New Holland, and the South Sea Islands; but they are more numerous in the Northern than in the Tropical regions, and the largest number are found in Europe. They climb the trunks of trees and reeds by a succession of short and sudden flights, run up them like the *Woodpeckers*, and dangle in all kinds of attitudes. In the summer they are not much seen, as they retire to the forests for the purpose of

breeding; but in winter they are common in the open country and our gardens. They are voracious, courageous, and extremely active; feed especially on insects, of which they are great destroyers, and also upon seeds and fruits, but they do not eat the whole seed, as they break a hole through its shell and peck out the kernel; small and weakly birds they also prey upon, destroying them by repeated blows with their beak upon the head. In form they are thick-set and strong, and their colours chaste and quiet, except in one or two species. Most of them build in holes of trees, but some make very curious nests, which they suspend either to the branches of trees or among the reeds, like some of the aquatic warblers.

The *Long-tailed Titmouse* (*P. Caudatus*), figured on Plate 6, is a well-known European species. It is about five and a half inches long, including the tail, which is rather more than three inches. It is exceedingly quick on the wing; feeds on chafers, beetles, and spiders; and in some parts of the country it builds a very curious and elegant nest, called a featherpoke.

The genus is divided into three sections:—1. Those with alar quill of moderate length, twelve species; 2. Those whose alar quill is short and deficient, three species; and 3. Those with beak straighter and more pointed, five species.

EMBERIZA—*Bunting*. The birds which form this genus are many of them natives of the British Isles; they are granivorous, and the hard structure on their palate enables them readily to break their food before swallowing it.

The *Ortolan Bunting* (*E. Hortulana*), Plate 6, is rather smaller than the Yellow Hammer; it has the back of an olive colour; the throat, bill, and legs, yellow; wings deep brown, as is also the tail, except the outer feathers, which are white on their inner edge. These birds are natives of France, Italy, Germany, and Sweden, but not of England: they are caught for the table, and considered fine eating.

The other species are:—The *Yellow Bunting*, the *Reed Bunting*, the *Snow Bunting*, and the *Common Bunting*.

FRINGILLA—*Grosbeak*. We follow the arrangement of Temminck, which includes all the subgenera noted by Cuvier, except *Ploceus*, adding also some of the Buntings, *Emberizæ*, and the Grosbeaks, which belong to the *Loxia* of Linnæus. The greater number of species belong to warm climates, but many are found in England and other parts of Europe, and afford us some of our most favourite and domestic songsters. They live on grain and seeds, which they shell by nipping between the mandibles before swallowing. They are excellent breeders, laying their eggs many times in the course of the year: they are usually considered great enemies to agriculture; but it may be doubtful, whether the ravages which the old birds commit on the corn fields are not compensated by the immense destruction they make among the eggs and larvæ of insects, in order to support their young.

The genus is divided into three subgenera, from the form of the beak:—1st. Broad-billed Finches, to which division belong the *Sparrows*, which form the genus *Pyrgita* of Cuvier; their beak not being quite so large as in others: they form the connecting link with the genus *Ploceus*. There are fourteen or fifteen species, of which the *House Sparrow* (*F. Domestica*) and the *Canary Finch* (*F. Canaria*) are well-known species.

2. *Short-billed Finches*, of which the *Chaffinch* (*F. Cœlebs*), Plate 6, is the most common species; it is rather larger than the House Sparrow: forehead black; crown of the head, back, and sides of the neck bluish-ash; sides of the head, throat, front of the neck, and chest vinaceous-red in the male; back and scapulars reddish-brown, tinged with olive; wings and tail black; belly, thighs, and legs, white tinged with red; legs brown; sides hazel; beak blue, tipped with black. The plumage of the female inclines to green and has no red on the breast. The Chaffinch is a sprightly bird, common in England and throughout Europe; inclined to be pugnacious, the males frequently fighting with each other till one is fairly beaten. Though commonly a bird of passage, it is nevertheless, to be found in England throughout the year.

The number of species is about twenty-four, including the *Linnet*s (*Vidua* of Cuvier), and several of the genus *Loxia* of Linnæus.

3. *Finches with long beaks*, including the *Goldfinch* (*F. Carduelis*), the *Parrot Finch* (*F. Psittacea*), and the *Lesser Redpole* (*F. Linaria*). There are nine species.

LOXIA—*Crossbill*. The remarkable peculiarity distinguishing the *Crossbills* is implied in their name, each mandible inclining towards its point in an opposite direction to the other, so that as they are considerably curved towards the point, they cross each other, and give the beak a very remarkable appearance. The use of this peculiar structure has been well described by Buffon:—"The bill hooked upward and downward, and bent in opposite directions, seems to have been formed for the purpose of detaching the scales of the fir-cones and obtaining the seeds lodged beneath them, which are the principal food of the bird; it raises each scale with its lower mandible, and breaks it with the upper."

The *Common Crossbill* (*L. Curvirostra*), figured on Plate 6, is about six inches long: the general colour of the plumage is dingy green. Quills of the wings and tail blackish edged with green, the great and little coverts edged with yellowish-white; legs brown. It is native of the Northern regions and of the Alps and Pyrenees, whence it migrates during the warmer seasons. It visits England in June.

The *Parrot Crossbill*, very rare in England, and the *White-winged Crossbill*, native of North America, are the other two species.

CORYTHUS—The *Pine Grosbeak* (*C. Enucleator*), and the *Parrot-billed Grosbeak* (*C. Psittaceus*), constitute this genus. The former species (Plate 6) is about nine inches in length; general colour crimson rose; the beak and lesser wing-coverts black; greater wing-coverts tipped with white; belly straw coloured; tail feathers black with pale edges; legs brown. Very common in North America, but occasionally, though not often, seen in England.

PARADISEA—*Paradise Bird*. The Paradise Birds are called by the natives of New Guinea, and the neighbouring isles, from which they are brought, *Manucodes*, which, in their language, signifies *God's birds*, on account of the wonderful virtues attributed to them by the priests of the country. And from their being but little seen during incubation, a notion arose that for the time they migrated to the terrestrial Paradise, and hence, perhaps, has originated their generic name.

The *Emerald, or Greater Paradise Bird* (*P. Apoda*, *Lin.*) about the size of a Thrush, measuring thirteen inches from the tip of the beak to the extremity of the tail; upper part of the body, chest, and belly, chestnut-brown; forehead velvet-like black glossed with green; top of the head and upper part of the neck citron-yellow; upper part of the throat golden-green; front of the neck violet brown; sides of the body furnished with long feathers, which extend far beyond the tail; their barbs are loose and thread-like, of a yellowish-white colour, spotted towards the tip with a little purplish-red; caudal quills ten, besides which two long horny pendicles covered with down, and beset with rough hairs instead of barbs, and terminating in a point, pass from each side of the rump to a considerable length forming a curve of nearly two feet long; beak horny; legs lead-coloured. Is found in New Guinea, and in the Islands of Aron, Tidor, and Waigiou. The Paradise Bird flies with rapidity, and rises very high in the air, on account of the length and suppleness of its feathers, and hence has been called the *Ternate Swallow*.

The Papuan, the Sanguine, the Magnificent, the King, the Superb, and the Golden-breasted Paradise Birds, form, with the species just described, the genus *Paradisæa*.

BUPHAGA—*Beef-eater*. There is one species the size of a Lark, native of Africa. They alight on cattle and pick out the larvæ of the Gad-fly, hence it has got the name of Beef-eater.

CASSICA—*Helmet-bird*. The name Cassicus is assigned to it on account of the base of the beak rising on the forehead and sloping out the feathers



Bird of Paradise.

so as to give the idea of a helmet. These birds are gregarious, living together in large societies like the Rooks; they construct their nests in the form of an alembic, the entrance being by a narrow neck, which is attached to the branches of trees. They are generally natives of America, living upon insects and maize, upon which they commit great depredations, so that in some parts of the United States they have acquired the name of *Maize Thieves*.

Cuvier has divided them into three subgenera, *Cassicus*, three species; *Icterus*, six species; and *Xanthornus*, twelve species; from some trifling differences in the shape of the beak.

COLIUS—Coly. Size of a Thrush, natives of Africa and the Indies, live on fruit.

CORACIAS—Roller. This genus belongs to the old world, and very nearly resembles the *Jay* (*Corvus Glandularis*) in its habits, and the loose feathers on the forehead; their plumage is very vivid and beautiful; their note very unharmonious. There are nine species, of which the *Roller* (*C. Gracula*) is the only British species, and very rare here; it is about the size of the *Jay*; is a very wild bird, although sociable with its own species; builds in birch trees, and feeds upon worms, grain, and roots. It makes a chattering noise, whence its name *Garrulus*.

CORVUS—Crow. The birds which form this genus do not differ from the others in the family *Coniostres*, in any material circumstance, except their size; their internal structure being the same. With respect to their habits, they are generally very cunning, and when domesticated are fond of stealing and hiding things for which they have no use, as pieces of money, &c. They build usually in trees, and lay from four to six eggs. As to food, they live principally on the grubs of Chafers and other insects, and also upon grain, but they are not such destroyers of seed as is commonly supposed. They are divided by Cuvier into five subgenera, according to the arching of the beak, the length of the tail, and the existence of a tuft.

The Crows form the first subgenera, which includes eight species.

The *Raven* (*C. Corax*) is the largest of all the birds belonging to the *Passerine* order, and equals the Domestic Cock in size, being about two feet in length. The Raven lives more retired than the other species of this genus, amongst the woods in the neighbourhood of towns; he feeds upon carrion and other offal, which he scents at a great distance, and he lives to so great an age, that in many languages expressions are borrowed from him to designate longevity. They fly at a great height, and usually in pairs, during fine weather, making a deep loud noise, different from their usual croaking. They are much attached to their old habitations.

The *Carrion Crow* (*C. Corone*) is not half the size of the Raven, but very nearly resembles it in colour; its beak, however, is not so much arched, nor the tail so square. They are more numerous than Ravens, and live in pairs in the woods; like them also they live upon carrion, worms, insects, and different kinds of grain. Their croaking was considered by Virgil as foreboding rain; and like the Raven is believed to be a bird of ill omen.

The *Rook* (*C. Frugilius*). The Rook in size and plumage resembles the Crow, but it differs from it in having the base of the bill covered with a rough scabrous skin, which in the old birds is white. Rooks live principally upon insects, or rather upon the grubs of insects, particularly that of the Dor-beetle, or Cockchafer; and it has been observed, that better crops have been obtained from patches of ground on which Rooks have alighted in search of food, than others from which they have been driven; so that they make ample compensation for the mischief they do in corn-fields. Rooks are gregarious, and are the only birds of this genus which are so; during the day they are out in large flocks in quest of food, but at night they return home to the rookery, which has been beautifully described by Virgil:—

————— E pastu decedens agmine magno,
Corvorum increpuit densis exercitus alis.

The *Jackdaw* (*C. Monedula*) is a much smaller bird than the Rook, not measuring more than thirteen inches in length. It is very common in England, and builds in church towers or ruins, in large flocks; it rarely builds in trees, but has been occasionally found in Rabbit burrows. They are easily tamed, and taught to speak some words.

The Magpies constitute the second division: they are not so large as the Crows; the upper mandible is more arched, and the tail long and cuneiform.

The *Magpie* (*C. Pica*) is notorious for its mischievous propensities, and is very familiar; it also may be soon taught to speak. It seems confined to the temperate and northern regions. The number of the species is eight.

The Jays, Nutcrackers, and Temias, are the remaining subgenera.

The *Jay* (*C. Glandularius*), though one of our most common birds, is remarkably beautiful; it is about thirteen inches long; neck, back, and breast of a light cinnamon colour; bill black; eyes white; the head-feathers white, streaked with black, and forming a tuft, which can be elevated or depressed at pleasure; lesser wing-coverts bay, greater barred with black, little blue and white alternately; tail black and edged with brown. The Jay builds her nest on the top of underwood, laying a foundation of coarse sticks, and afterwards the fine fibres of the roots of trees; and the young follow the parent till the following spring. They live upon acorns during the winter, whence their specific name, but during summer make great havoc amongst peas and cherries. Their note is very harsh, but when domesticated they will soon imitate many words and sounds.

GLAUCOPIS—Wattle Bird. About the size of a Jay; feeds on insects, commonly walks; is a native of New Zealand.

GRACULA—Grakle. About the size of a Thrush; learns to talk; found in Java.

MYOPHONA. One species, twelve inches long, found in Java.

PHYTOTOMA—Plant-cutter. A mischievous bird, size of a Quail, native of South America.

PLOCEUS—Weaver Bird. This genus of birds is named from the peculiar dexterity with which they weave their curious and often very complex nests. The size of their beak allies them with the *Cassici*, from which, however, they are distinguished by having the commissure of the beak straight instead of forming an angle.

There are thirteen species, or more, natives of Africa and South America.

PSITTACIROSTRA. Very nearly approach the *Fringilla* and *Psittaci*: found in the South Sea Islands.

PYRRHULA—Bullfinch. The birds included in this genus were separated from the Grosbeaks of Linnaeus by Brisson, on account of the difference in the form of their beak. They are found in all parts of the world excepting New Holland; are least in number in Africa, but are numerous in temperate and cold regions. Those which live in northern climes keep close to the woods in summer, and approach the habitations of man only during winter. They feed generally on grain, which they separate from the husks, and are fond of the buds of trees.

The species are numerous; some of which are natives of northern latitudes, some of tropical climes, and some of temperate regions.

STURNUS—Stare or Starling. There has been much confusion in reference to the species belonging to this genus, many of which belonging to those of *Lamprolornis* and *Pastor* were formerly included in it. From the former of these genera the *Sturni* are distinguished by the beak being flat above and not notched, instead of curved above and toothed; by the second and third alar quills being longest, instead of the fourth or fifth; and by the middle toe being connected with the outer instead of the inner toe.

The Starlings live and migrate in flocks from colder to warmer districts as winter approaches, but return in spring, and are generally found about marshy districts, feeding in the meadows amongst the cattle, upon insects principally, but also upon grain. They build their nests in the hollows of trees, under the tiles of houses, and in holes in the wall, and are spread all over the globe.

The first subgenus includes those without wattles, of which the *Common Starling* (*S. Vulgaris*), the Sardinian, the Louisian, the Magellanic, the Chilian, the Pied, the Greenish, and the Red-headed Starling are the species.

The *Wattled Stare* (*S. Carunculatus*), the *Merops Carunculatus* (*C. Phaeroides*), and the *Certhia Carunculata* (*C. Musicus*), form the second subgenus.

Family—SLENDER-BEAKED; *Tenuirostrata*.

The individuals of this family are distinguished by their long, slender, and unemarginated bills: the bills are in some straight, in others more or less curved.

ILLUSTRATIVE EXAMPLES.

PLATE 6.

Genera.	Species.	Common Name.
Sitta - - - -	Europæa - - - -	Nuthatch.
Xenops - - - -	Rutilans - - - -	—
Certhia - - - -	Familiaris - - - -	Common Creeper.
Tichodroma - - - -	Muraria - - - -	Wall Creeper.
Trochilus - - - -	Delalandii - - - -	Delalandi's Humming-bird.
Upupa - - - -	Epops - - - -	Hoopoe.

Other Genera of this Family:—Cinnyris, Melithreptus, Pomatorhinus, Synallaxis, Tinactor.

CHARACTERS OF THE GENERA.

1. SITTA.—Beak straight, depressed, cylindrical, conical, and sharp at the point; nostrils rounded, basal; tail composed of twelve quills square or slightly graduated; feet furnished with three toes in front, the outer connected at its base to the middle, and one behind having a very long and curved claw.

2. XENOPS.—Beak short, slender, awl-shaped, compressed, pointed, tip turned upwards; upper mandible nearly straight, lower mandible very much curved upwards; nostrils basal, lateral, ovoid, and covered with membrane; lateral toes nearly equal, the outer and middle ones connected to the second joint, claws strong, compressed, and curved.

3. CERTHIA.—Bill slender, incurvated, sharp-pointed; tongue pointed generally, but sometimes cleft; legs stout; toes three before and one behind, which is the largest; claws hooked and long; tail composed of eight feathers.

4. TICHODROMA.—Beak very long, slightly arched, slender, cylindrical, its base angular, and point depressed; nostrils basal, naked, and pierced horizontally, half closed by membrane; wings large; tail rounded; of the front three toes the outer is connected to the base of the middle; hind claw very long.

5. TROCHILUS.—Beak long, thin, varying in different species from straight to much curved; upper mandible broad as the forehead, tip sharp; lower mandible almost completely hidden within the upper; tongue long, extensible; nostrils basal, marginal, very small, covered with a broad vaulted membrane, and open in front; wings long and sharp; legs very short, the tarsus shorter than the middle toe, and often feathered; toes three in front, the inner two slightly connected at their base, and one behind armed with slender curved claws.

6. UPUPA.—Head furnished with a crest, consisting of a double row of long feathers, capable of elevation or depression at will; beak very long and slender, compressed, trigonal and slightly arched; nostrils basal, lateral, ovoid; wings of moderate length; toes three in front, with short, slightly-curved claws, and one behind with the claw nearly straight.

The general characteristics of the "other genera," will be found after Description of the Illustrated Species.

TENUIROSTRATA.—DESCRIPTION OF THE SPECIES.

SITTA—*Nuthatch*. The birds forming this genus are considered by most ornithologists to be found in all parts of the world, Sir William Jardine excepted, who restricts them to Europe and South America. They are extremely restless and active, running up and down the trunks and branches of trees with great rapidity in search of insects on which they live, and which they extract from the holes or cracks by means of their strong awl-like beaks. They also, however, feed upon the kernels of nuts or fruits, and hence the name *Nuthatch*; but Wilson is disposed to think that the bird only breaks up the nuts in search of maggots often there contained. It is certain, however, that they are also seed-eaters. They make their nests in the holes of trees, or under the eaves of barns.

The *European Nuthatch* (*S. Europæa*) is five inches and a half in length; all the upper parts ashy-blue; throat white; front of the neck, chest, and belly, yellowish-ferruginous; flanks and thighs chestnut-red; middle two tail-quills grey, lateral quills black; beak bluish-ash; legs grey. The colours of the female are less brilliant, and the black streak above the eye less distinct. They make their nest of old leaves in the hollow of a tree, and, according to Montagu, choose the deserted habitation of some Woodpecker. The female lays from five to seven eggs of a greyish-white colour spotted with brown, and sits close, being provided with food by her mate; she is, however, easily disturbed from her nest, and then utters a hissing sound like a snake. In the spring the Nuthatch utters a loud shrill whistle. If taken young they may be tamed, but are very impatient of confinement, and often kill themselves in attempting to escape if caged when older. (Pl. 6.)

XENOPS.—The individuals composing this genus climb as well as the Woodpeckers (*Picus*), and Prince zu Weid says that he has never seen them sit upright; they also tap the trees like the Woodpecker, but are less lively and noisy than the Nuthatch. They are not shy, but like the *Creepers*, approach the neighbourhood of human dwellings. There are two species, the *Xenops Genibarbis* and the species figured on Plate 6, *Xenops Rutilans*. The former is five inches and a quarter long, the latter is but four inches and a half, or three-quarters of an inch in length: the top of its head is greyish-brown, streaked rufous; over each eye a rufous streak; upper parts and also the wings rufous-brown; under parts greyish-brown, with numerous white spots; wings speckled; legs dusky blue.

CERTHIA—*Creeper*. This genus has frequently been confounded with the *Humming Bird* or *Trochilus*, but it differs from it in having the bill sharp and pointed, however different the shape may be in the different species: whilst in the *Trochili* it is more or less blunt. They are subdivided into six subgenera: 1, *Certhia*, *The True Creeper*; 2, *Dendrocopates*, or *Picucules*; 3, *Tichodromæ*, or *Wall Creeper*; 4, *Nectarina*; 5, *Dicaea*, and, 6, *Heorotarius*, *Honey-sucker*. The species are numerous. One of the species of the first division, the *Common Creeper* (*C. Familiaris*), Plate 6, is one of the smallest British birds; it is five inches long and six and a half broad; its bill is hooked—the upper mandible brown, the lower whitish; general colour of the plumage brown above, streaked with black; breast and belly white; rump and tail tinged with red, the latter cuneiform. The female is not so bright in its colours. It is a native of Europe, Asia, and America, and is very common in England; it runs upon the bark of trees with as much facility as a fly walks upon glass, in search of insects upon which it feeds. It has no song, but its note resembles *zich zich* repeated deliberately.

TICHODROMA—*Wall Creeper*. This genus was included among the Linnæan *Certhiæ* till separated by Illiger; from this, however, it is distinguished by the weakness of the stems of its caudal quills; and the great length of its hind claws. One species, the *Wall Creeper* (*T. Phœnicoptera*), Plate 6, measures about six and a half inches in length; beak and irides black; top of head deep ash; nape, back, and scapulars pale-ashy; throat and front of neck deep black; under parts blackish-ashy; wing-coverts bright red; legs black. The female has the top of the head ashy like the back, and the throat and front of the neck white, tinged with ashy. They moult twice a year; the males have their black throat only at their spring moult; after breeding-time these feathers gradually drop out, and after the autumnal change the males are not to be distinguished from the females. They are found in the southern parts of Europe upon low rocks, and rarely upon those of moderate height.

TROCHILUS—*Humming Bird*. This most beautiful and minute section of birds has been generally divided by the French naturalists, from Brisson to Lesson, into two distinct genera, in consequence of some having the beak straight and others having it curved; the only distinction which, the latter writer admits, can be observed either in their organization or habits. Linnæus has, however, included all under one single kind, and has been, in this respect, followed by Temminck, and also by Prince Maximilian.

The tongue of the Humming Birds has considerable resemblance to that of the Woodpeckers (*Pici*) in its great extensibility, the branches of the bone

supporting it, winding round, as in the latter genus, upon the sides of the back of the skull, and ascending upon its surface, and which, being acted on by muscles, are depressed, and, straightening, project the tongue itself to a considerable distance from between the mandibles. Hence, Prince Maximilian observes, the epithet Flowerpecker would be much more apposite than that of Fly-bird, as it is called by the French. The tongue itself is of a very peculiar form, well adapted, when introduced into the tubes of flowers, to feel there the most minute insects, and to seize and carry them back to their beak.

The Humming Birds are almost constantly on the wing: and during summer they are seen plunging their long tongues into the bottom of the flowers, and bringing them back loaded with honey or with insect food. More rarely they settle on the petals of the flowers, and perform the same actions. If wearied by a long flight, they rest upon some slender twig in the shade of a dark foliage, and here their nest is usually found.

Humming Birds seem not to have any song; they only utter occasionally a little indistinct cry, which Buffon has rendered by the syllables *screp, screp*; but more faithfully expressed by Vieillot as *tère, tère*, uttered with more or less power, and most commonly in a shrill tone. With two exceptions, and those of the straight-billed section, the Humming Birds are found only within the tropics. Brazil, Guiana, the northern parts of Paraguay, and the Antilles, possess them in great numbers. In India and the Asiatic continent they are represented by the *Cæreba*; in Africa by *Cinnyris* and *Nectarinia*; in Australia and the Southern Pacific by *Meliphaga*, *Myzomela*, &c. The most striking characters of the Humming Birds have been described in glowing, but not exaggerated language, by Buffon—"Of all living beings," says he, "they have the greatest elegance of form and brilliancy of colours. Precious stones and metals polished by art are not comparable to this bijou of Nature, who has placed them among birds at the lowest degree in the scale of size, *maximè miranda in minimis*; her *chef-d'œuvre* is the little Fly-bird, upon which she has heaped all those gifts which, amongst other birds, she has only distributed. Swift, rapidity, agility, elegance, and brilliancy of clothing all belong to this little favourite. The emerald, the ruby, the topaz, blaze on its plumage, which it soils not with the dust of the earth, and throughout its aerial life it scarcely for a moment touches the sward. It is always in the air flying from flower to flower: it has their freshness as well as brilliancy, lives on their nectar, and dwells only in those climes where they are constantly renewed."

The species, which are numerous, are divided into—1, The *Straight-beaked* (the *Ornismya* of Lesson), and 2, The *True Humming Birds* (*Trochilus*). The bird figured on Plate 6 (*T. Lalandii*) is a species of the first division.

UPUPA—Hoopoe. But two species of Hoopoes are known, of which one, the *Common Hoopoe* (*U. Epops*), is European. It is about eleven inches in length, beak flesh-coloured; irides brown; feathers of the crest (which is arched) rufous; sides of the head, neck, chest, and belly pale buff; back crossed with three half circular bands; wing-coverts black; tail-quills black, with a well-marked white patch about their middle; legs and toes brown, with black claws. The female differs little from the male, except in the crest being much shorter and the colours of the plumage less clear. The Hoopoe (Plate 6) is found throughout the year on the northern coast of Africa; is common in Italy from May to September; and is found throughout Europe at different times of the year, but principally towards the south; it, however, migrates northward, and visits Germany, England, Holland, and other northern climes; but in this country it appears generally in the autumn, after breeding-time has passed. They are fond of basking in the sun, and express their enjoyment by uttering, in a quivering tone, the syllables *vec, vec, vec*. Their call for another is a sharp note, and occasionally they utter a sound closely resembling the words *hoop, hoop, hoop*.

CINNYRIS—Sugar Bird. This genus is separated from Cuvier's *Certhia*, of which it formed a subgenus, in consequence of its forked tongue; the birds of which it is composed belong to Africa and the Indies, live upon the nectar of flowers and insects, and have generally a pleasing note. Their

plumage is very beautiful, and generally more or less of a bright golden green. There are about twenty-eight or thirty species.

MELITHREPTUS—Honey-eaters. This genus was formed by Vieillot from the *Certhia* to include the *Honey-suckers* of the South Seas, and is the same as Temminck's *Drepanis*. They live on honey, on the honeyed juices of plants, and on insects, and are found in the Sandwich Islands.

POMATORHINUS.—The peculiarity of this genus is observed in the horny covering of its nostrils; but according to Dr. Horsfield's observations it is connected with the *Toothbilled* family by the strength of its beak, in which respect it approximates to the *Meliphagæ* of Lewin, or *Philedones* of Cuvier, as also in the connexion of its outer toes and the stoutness of the hinder claw. In its own family it more nearly approaches that division of the genus *Cinnyris*, which has the beak of moderate length.

The species are, the *Mountain Creeper*, found in Java; the *P. Turdinus*, and the *P. Trivirgatus*, natives of New Holland.

SYNALLAXIS. This genus forms a transition from the *Anabates* to the *Sylvia*, resembling the former in the shape of their beak, which is, however, less elevated, and, like them, having great similarity in the distribution of their colours to the Woodpeckers, resembling them also in the shape of their tongue, their tall heels, and their graduated tail; but the general form of their body and their habits are similar to those of the *Sylvia*. The colour of their plumage is very uniform. They are all natives of South America, from Brazil and Chili to the Straits of Magellan, inhabiting the damp parts of thick woods and open plains covered with bushes and thickets. They are lively, always in motion, creeping through the thick low bushes, hopping upon the branches, and climbing around them like Titmice in search of insects, their larvæ, and eggs. Their flight is neither high nor long sustained, but like that of the *Sylvia*. Prince Maximilian says he has never heard them sing, but only utter a short call.

TINACTOR. This genus, formed by Prince Maximilian zu Weid, forms a decided transition from *Myiothera* to *Dendrocolaptes*, but is readily distinguishable from them. The species *T. Fuscus* is found in the woods along the river Itabapana, between 21° and 22° South latitude, and becomes more numerous northward. They are commonly found suspended, or climbing up the trunks of old trees; but their climbing powers are not very great, for they rarely go far up, and soon descend to the ground.

Family—TOE-TIED; *Syndactyla*.

The outer toe of the Birds forming this Family is nearly as long as the middle one, with which it is connected as far as the second joint.

ILLUSTRATIVE EXAMPLES.

PLATE 6.

Genera.	Species.	Common Name.
Merops - - - -	Apiaster - - - -	Common Bee-eater.
Alcedo - - - -	Ispida - - - -	Kingfisher.

Other Genera of this Family:—Buceros, Ceyx, Prionites, Todus.

CHARACTERS OF THE GENERA.

1. **MEROPS.** Beak slenderish, tetragonal, and compressed, pointed, cutting, slightly arched, and without any tooth; ridge elevated; nostrils basal, lateral, roundish, open, but hidden in hairs projecting forward; tarsi short, four-toed, the outer joined to the middle by membrane as far as the second joint, and that with the inner to the first joint, hind toe having a broad base, its claw the smallest; the first primary very short, the second longest of all.

2. **ALCEDO.** Beak long, straight, stout, angular, somewhat compressed, and laterally pointed; tongue short; tail sometimes short; feet small and weak; the outer toe united to the next.

3. **BUCEROS** (Gr. *βοῦς*, an Ox, and *κέρας*, a horn). Beak very large, hooked downwards, notched, and surmounted at its base by a large horny appendage nearly as big as the beak itself, but varying in form, and of a

cellular structure within; nostrils, close to base of beak, oval and patulous; feet short, and toes distinct.

4. CEYX (Gr. *κηξ*, a sea fowl). Beak very long, straight, pointed, and angular; inner toe not apparent.

5. PRIONITES (Gr. *πρίων*, a saw). Beak strong, tough, convex above and bent towards the tip; edges of the mandibles toothed like a saw; nostrils basal, lateral, oblique, patulous; wings short, the first three quills graduated, the fourth and fifth the longest; legs of moderate size; lateral toes of unequal length, inner toe very short, outer connected with the middle as far as the second joint.

6. TODUS. Beak long, straight, obtuse, much wider than its depth, and the ridge distinct; tip of the upper mandible divided, the lower obtusely truncated; nostrils far from the base on the surface of the beak, patulous and rounded; legs of moderate length, the lateral toes unequal, the outer connected to its third, and the inner to its second joint.

SYNDACTYLA.—DESCRIPTION OF THE SPECIES.

MEROPS—*Bee-eater*. The Bee-eaters have a great resemblance to the Swallows, in the length of their body, their white throat, and long wings; and like them they are continually flying about in search of food, occasionally perching on dead branches, but rarely upon the ground, for which the shortness of their legs ill adapts them. Like the Kingfishers and many Swallows, they burrow in banks, and at the bottom of their hole make a nest of moss. They feed on Bees, Wasps, and other insects. If not teased, they are easily approached, but are readily frightened by gun-shot; if any one come near their nests they plunge into them, uttering at the same time shrill cries, and if the disturbance be repeated they leave them: as they are fat and fleshy they afford good food, but on account of the toughness of their skin must be previously flayed. The females and young have the same colours as the male, but they are less vivid. They are confined to the hot climates of the old world, and visit some of the southern countries periodically as birds of passage.

The *Common Bee-eater* (M. Apiaster) is about eleven inches long and seventeen in breadth; the forehead whitish tinged with green; back of the head, nape, and top of the back chestnut, the remainder of the back yellowish-red; middle of the wings deep rust; their quills and those of the tail greenish-olive, the middle two of the latter being an inch longer than the others; from the angle of the gape a black line passes through the eye and upon the ear; the throat light golden-yellow, and bounded below by a semicircular black collar; under parts bluish-green; beak black; iris red; legs brown. The colours of the female more dull. This bird is occasionally found in the south of Germany, Switzerland, and France, where it is more common; rarely in England; frequently in the south of Europe; and in autumn it migrates towards Egypt. It feeds on Bees, Wasps, Drones, Grasshoppers, Chafers, Gnats, and other insects, builds in deep holes pierced in the banks of rivers, and lays five or seven purely white eggs. The cry of the Bee-eater is described by some Naturalists as consisting of the syllables *grulgrurural*, by others as *crou, crou, crou*, accompanied, as Sonnini states, with a cracking of the beak. As Grasshoppers are favourite food of the Bee-eaters, the children in the Isle of Candia make use of them as a bait, fastening them on a crooked pin to which a string is attached, and thus as it were fish for the bird.

ALCEDO—*Halcyon*, or *Kingfisher*. The first portion of its name is taken from the royal splendour of its plumage, and the second from its usual food. It is easily distinguished from other British Birds by its large body, short and thick neck, very long bill, diminutive feet, and short tail. The Kingfisher is a truly handsome bird; it is about seven inches long, of which the tail is one inch and a quarter. The beak is a horny-brown colour; irides dark brown; throat reddish-white; a broad orange stripe extends from the nostrils beyond the eyes; the wing-coverts and tertials are dark green studded with spots of verditer-blue; scapular and back a brilliant sky-blue; cheeks and ear-covers pale chestnut; under parts chestnut; tail dark blue above, blackish underneath. (Plate 6.)

The number of species is twenty-four, which are divided into three

subgenera, namely,—1. Arrow-shaped tails; 2. Square tails; 3. Forked tails.

BUCEROS—*Hornbill*. The birds which forms this genus are remarkable for being allied with the Toucans by the size of their beak; with the Kingfishers and Bee-eaters in the form of their feet; and with the Raven genus in their general habits. They live indiscriminately both on vegetables and the smaller kinds of animals, and do not even despise carrion. Some of them have the horny crest, whilst others either do not have it at all or only very small, which has induced Cuvier to make two divisions, those with crests seventeen species, and those without crests eight species. They are natives of Java, the East Indies, Ceylon, and parts of Africa.

CEYX. This genus has been separated from the *Alcedo* or Kingfisher genus, in consequence of the inner toe not coming through the skin; but in other respects, it is very similar to that genus. There are but two species, the *C. Tridactylus* and the *C. Tribrachys*.

PRIONITES. All these birds are natives of the hottest parts of America, and are found in the forests, building in the holes of trees; they live principally on insects, and occasionally on small birds. There are four species, one of which measures fourteen inches in length.

TODUS. Vieillot enumerates a considerable number of species in his genus *Todus*; Temminck, however, restricts it to a single one, and places all the rest among his *Platyrhynchi*, which are distinguished by the flattened curved tip of their beak, by its ridge being indistinct, by the nostrils being partially closed by a little feathered membrane, and by the connection of the outer and middle toes to the first joint. That one is the *Green Toddy* (T. Viridis), native of St. Domingo, where it is called the Ground Parrot, from its green colour and its remaining almost always on the ground.

The Kingfisher is common throughout the greater part of Europe, and in our country it remains throughout the year, its haunts being the vicinity of streams, ponds, rivers, and brooks. It is a voracious though beautiful bird; hovering over the water, watching till some unwary fish rises near the surface, it suddenly drops down and secures its prey. It devours not only small fish but leeches and water-insects. It breeds in holes, either excavated by itself or by the water rats; the female lays from five to seven eggs which she hatches, being supplied with food by her mate during the period of incubation. The Kingfisher is solitary in its habits, preferring quiet, secluded nooks, or other sheltered places, where it may be safe from the intrusion of man.

ORDER III.—SCANSORI. CLIMBERS.

THE structure and arrangement of the toes in the various genera of this Order, with the exception of the Trogons, are such, that they possess a powerful grasp, of which certain of the genera avail themselves to climb the trunks of trees in quest of food, which consists of insects or fruits. Their outer toe is directed backwards, like a thumb. They nestle generally in the holes of decayed trees.

Family—YOKE-TIED; *Zygodactyla*.

ILLUSTRATIVE EXAMPLES.

PLATE 7.

Genera.	Species.	Common Name.
Galbula - - - -	Macroura - - - -	Long-tailed Jacamar.
	Grandis - - - -	Great Jacamar.
Picus - - - -	Martius - - - -	Great Black Woodpecker.
	Tridactylus - - - -	Three-toed Woodpecker.
Yunx - - - -	Torquilla - - - -	Wryneck.
Picumnus - - - -	Minutissimus - - - -	Smaller Picus.

Other Genera of this Family:—Bucco, Crotophaga, Cuculus, Musophaga, Phœnicophaeus, Pogonias, Pteroglossus, Ramphastos, Scythrops, Tamatia, Trogon.

CHARACTERS OF THE GENERA.

1. GALBULA. Beak slender, long, straight, or slightly bent at the point, and four-sided; nostrils lateral, close to the base of the beak, and partially

covered by membrane; legs short, toes in pairs, the anterior pair closely connected by membrane; the external hind toe shorter than the inner; claws arched; wings moderate sized, the three first quills shorter than the fourth and fifth.

2. *PICUS* (Gr. *πέικω*, *I beat*). Beak long, straight, and pyramidal, cutting, and rather scissor-shaped towards the point; nostrils basal, oval, and open; in many species the head crested; wings of moderate length; tail consisting of twelve quills, their webs coarse, elastic, and tapering to the point; legs strong; toes two in front, connected to the first joint, and two behind distinct; more rarely only a single hind toe; claws much curved.

3. *YUNX* (Gr. *ῥύγξ*, *a bird which utters a shrill cry*). Beak short, straight, of a flattened cone shape, slender towards its tip, and its ridge rounded; nostrils basal, naked, and partially closed by membrane; wings of moderate length; feet with two toes in front, joined together, and two behind, divided; tongue projectile, with a horny tip.

4. *PICUMNUS* (Lat. *Picus*, a Woodpecker). Beak short, straight, conical; lower mandible of similar size and bulk with the upper, and both unnotched; nostrils basal, lateral, linear; wings rounded; tail very short; tarsi short, toes long and powerful, the front two connected as far as the first joint; the hind two divided, or only one single toe; outer toes long and of equal length, the inner short and equal also.

The general characteristics of the "other genera" will be found further on.

ZYGODACTYLA.—DESCRIPTION OF THE SPECIES.

GALBULA. This genus is connected with the *Kingfishers* (*Alcedo*) by the length and form of its bill, and the shortness of its legs; it frequents moist woods, and lives entirely on insects. In some, which are natives of America, the beak is quite straight, and among the Indian species some have the beak shorter, larger, and a little curved; thus connecting the genus with the *Bee-eaters* (*Merops*): their front toes are also more distinct. Such are the *Great Jacamar*. (Plate 7.)

PICUS—*Woodpecker*. This large group of birds is distributed all over the world, except Australia; but as they are especially adapted for climbing trees, those countries in which large forests are common would naturally induce a supposition that they should be found in greater numbers there than elsewhere; which turns out to be the case, as the greater number of species are found in the tall and almost endless woods of America, and among them are those species which more especially, by the greater development of their peculiar form, characterise the genus itself. Most of the Woodpeckers are remarkable for the facility with which they run up the nearly perpendicular trunks of trees: the great length of their hind toes, and the curving of their claws are particularly adapted for this purpose; and as in climbing the weight of the body is thrown much backwards, an additional support or stret is provided in the tail feathers, which are very strong and elastic, and which the bird has the power of depressing against the trunk of the tree, so as to employ it as a rest and support, whilst it moves one or other of its legs onwards. Some few species, however, do not climb, but live almost entirely on the ground in open countries. The beak also is an organ of great importance: in the larger species it is of considerable size, and powerful muscles are attached to it, which enable these birds to hollow out very large cavities in trees, wherein they make their nests and deposit their eggs; but the smaller species, in which the bill is less powerful and more pointed, are obliged to content themselves with the natural cavities in trees; nor do they attempt to pierce the bark of trees, beneath which insects and their larvæ are found, as do the larger species, but take only those which they can procure by thrusting their long and extensile tongue into the clefts or other holes in the bark. When employed in searching for insects, they strike their bill with considerable noise against the bark, and which noise is commonly called *tapping*. The object of their repeated strokes is to disturb the insects beneath, and to drive them to those places where the bird can more readily get at them. It is a common notion that the Woodpecker damages trees by perforating the bark; this however is incorrect; on the contrary, his operations are advantageous, by

freeing the tree from the noxious insects, which but for him would destroy it, and which indeed frequently do so, notwithstanding the assiduous warfare of the Woodpecker. Wilson, in his "American Ornithology," has been the able advocate of these industrious labourers, and has shown the folly of dooming them to indiscriminate slaughter. "Here then," says he, speaking of the *Downy Woodpecker*, "is a whole species, I may say genus, of birds, which Providence seems to have formed for the protection of our fruit and forest trees from the ravages of vermin, which every day destroy millions of those noxious insects that would otherwise blast the hopes of the husbandmen, and which even promote the fertility of the tree; and, in return, are proscribed by those who ought to have been their protectors, and incitements and rewards held out for their destruction! Let us examine better into the operations of nature, and many of our mistaken opinions and groundless prejudices will be abandoned for more just, enlarged, and humane modes of thinking." Of the specimen from which Wilson drew his description (the *Ivory-billed Woodpecker*), he mentions, that having shot it near Wilmington, but only in the wing, it uttered a "piteous note, exactly resembling the violent crying of a young child," and that his horse was so frightened that he nearly lost his life. In passing through the town its cries were so affecting, that every one, women particularly, hurried to the doors with alarm and anxiety. When he had reached his inn, and had locked the bird up in his room, after an absence of an hour he returned, when it set up the same distressing cry, which seemed to have arisen in consequence of its attempt to escape by pecking away the lath and plaster near the window being discovered, and in which attempt, if undisturbed for another hour, it would have succeeded. Wilson then tied a string round its leg, and fastened it to a table, but on his return the bird had almost entirely ruined the mahogany table, on which it had wreaked its vengeance! It nestles earlier in the spring than any other species, and Audubon has seen it boring its hole in the beginning of March; this is always made in a live tree, generally an ash or hag-berry, and at a great height, and always with regard to the situation of the tree and the inclination of its trunk. As they prefer solitude, and are anxious to protect their hole from beating rains, it is is therefore generally dug under the junction of a large branch with the trunk, and in a spiral course. It is sometimes not more than ten inches deep, but at other times three feet. Both birds work hard at their job, one sitting outside to encourage the other, the place of which it takes when tired. Sometimes there is but one brood, but occasionally there are two, and the latter then appears about the 15th of August. Their food is principally beetles, larvæ, and large grubs.

The species are numerous, being about seventy-six, divided into Woodpeckers with four toes, two in front and two behind, and Woodpeckers with three toes, two before and one behind.

The *Great Black Woodpecker* (*P. Martius*), represented on Plate 7, is a species of the first division: it is about sixteen or seventeen inches long; in the male the whole of the top of the head is bright red, but in the female only a small patch on the back of the head. All the rest of the plumage deep black; beak bluish-white, with a black tip. Their flight is undulating, and rarely for any greater distance than from tree to tree. It is a native of the northern parts of Europe; is rare in Germany and France, and extremely rare in England.

The *Southern Three-toed Woodpecker* (*P. Tridactylus*), a species of the second division (Plate 7), measures nine inches in length; upper part of the head bright red, rest of the head and upper parts of the neck and body black, transversely barred with white; upon the cheek a white band; alar quills white, marked with regular black spots like scales; the four middle tail-quills black, the others varied with white and ferruginous; throat, front of the neck, chest, and belly white; sides of the body and under wing-coverts streaked with black; legs ashy; claws brown. The female has no red badge on the head, nor any white markings on the back and rump. This species is a native of Guiana, and very rarely penetrates the southern parts of North America.

YUNX—*Wryneck*. This genus, although provided with similar feet to the Woodpeckers, does not make use of its tail as a prop in climbing, for

which, indeed, the weakness of its feathers is not suited ; it does not, therefore, run up trees with the same facility, but clings only to the tree whilst it searches in the fissures of the bark for the insects on which it feeds. Very commonly they are seen on the tops of ants' nests, the inhabitants of which are their favourite food. Their tongue is long, with a horny tip, but not armed with recurved spines as in the Woodpeckers, and is furnished with a glutinous secretion from a pair of glands beneath the lower jaw, with which they entangle their prey. The quickness with which the tongue is projected and retracted is so great that the eye is unable to follow it ; and Montague observes that when the bird is feeding, an ant's egg, which is of a light colour and more conspicuous than the tongue, has somewhat the appearance of moving to the mouth by attraction, as a needle flies to the magnet.

The *Common Wryneck* (Y. Torquilla) is six inches and a half in length ; its general colour is brown with black rays or speckles. The Wryneck is very common during summer in the south-eastern counties of England ; is rare in Cornwall, and not known in Ireland. It is very rare in the north of England. In spring the male attracts the female by his full-toned call—*gui! gui! gui! gui!* not much unlike the whistle of the Kestrel. It is not unfrequently called the *Cuckoo's Mate* or *Maid*, from arriving about the same time as the Cuckoo, in the first or second week of April, and leaves us at the end of August or beginning of September. Its name, Wryneck, has arisen from the odd movements of its head and neck, sometimes describing parts of circles, at others from side to side with an undulating snake-like motion, whence, in some parts of England, it is called the *Snake-bird*.

PICUMNUS. This genus was formed by Temminck on the *Picus Minutus* of Latham, which differs from the Woodpeckers in having the tail rounded, and the webs of its caudal quills not coarse nor worn away. Their habits rather resemble those of the Creepers. The species are four—*Minutissimus*, *Cirrhatus*, *Exilis*, and *Abnormis*.

The *Picumna Minutissima* (Plate 7) is about the size of our Wren ; head golden, neck and chest marked with black and white zones ; back brown, marked with white spots ; the white part of the plumage tinged with yellowish. It is found in Cayenne in company with the Creepers, and, like them, runs up the trunks of trees, and suspends itself to their branches.

Bucco (Lat. *bucca*, the cheek). These birds have derived their generic name from the prominence of their bills at the base, which Brisson thought had some resemblance to the cheek. The head is ornamented by five bundles of stiff hairs or bristles facing forwards ; one on each side of the nostrils and the base of the lower jaw, and the fifth under the chin. They are found in Africa and the warmer parts of Asia and America, and are very dull heavy birds. Cuvier has thought proper to subdivide them into three : 1, the *Barbicans* ; 2, the *Barbets Proper* ; and 3, the *Tamatias*.

CROTOPHAGA (Gr. κρότων, *a tihe*, and φάγω, *I eat*). The birds which compose this genus are natives of the hot and damp parts of America ; their legs are long ; they live on insects and grain ; congregate, and many pairs lay their eggs in the same nest, upon which they sit close to each other in order to hatch them. They are easily caught, and may be taught to speak. The flesh is very rank.

CUCULUS—Cuckoo. Of this genus there is but one species found in Europe, and from this the facts concerning the true Cuckoos have been collected ; the others being natives of Africa and America. Some of them neither build nests nor tend their own eggs, but deposit them in the nests of other birds, and leave them to be hatched by their foster parent ; whilst others build nests, and sit on their own eggs, according to the usual habits of birds. Cuvier has divided them into six subgenera, of which the first alone can be considered as belonging to the true Cuckoos, or those which do not hatch their own eggs. They are insectivorous.

1. *Cuckoo Proper* ; thirteen species. 2. *Couas*, which differ only from the true Cuckoos in having the legs longer, but they are remarkable for not laying their eggs in other nests than their own ; seven species. 3. *Coucals*, the claw of whose outer toe is very long, and their outer hind toe capable

of great motion ; nine species. 4. *Courols*, beak large, pointed, straight, compressed, and the upper mandible slightly curved at the tip ; a single species, which Temminck has converted into a genus. 5. *Honey Guides*, beak short, thick, and conical, like that of the Sparrow ; tail cuneiform, and slightly forked ; skin very tough ; three or four species. 6. *Barbacous*, beak conical, long, slightly compressed, curved at the tip, and furnished at the base either with silky feathers or rough hairs ; two species, which bear a close resemblance to the *Barbet*.

The *Common Cuckoo* (C. Canorus) is the only one of the Cuckoo genus which is met with in England, or indeed in Europe, and is but a bird of passage ; it makes its appearance early in the spring, and leaves us about the middle of July. To what countries they go to on leaving us is not well ascertained, but it is certain that part of them visit Africa, as they are met with twice in the year at Malta, in their journey backwards and forwards. They are rare in Italy, but common at Aleppo, and even in India. The note of the Cuckoo is a call to love ; and he sits on the bare bough of a tree, repeating his song, which he loses when the amorous season is over. This note is so uniform, that the name seems to have been derived from it ; and thus we have in the English *cuckoo*, in the French *cou-cou*, in the Italian *cuculo*, in the German *kuckuk*, the Latin *cuculus*, and the Greek κόκκυξ.

That the Cuckoo does not hatch its own eggs, but deposits them in the nests of other birds is well known ; and various reasons, depending on the structure of the animal, have been assigned for this peculiarity, but all of them without warrant ; as other birds which are formed nearly in the same manner, tend their own eggs during the process of incubation. The egg is seldom met with in any nest till the beginning of May, and then usually in that of the Hedge Sparrow ; it is also found in those of the Wagtail, Titlark, Yellow Hammer, Greenfinch, and Whinchat. Dr. Jenner observed that during the time the Hedge Sparrow was laying her eggs, which took up three or four days, the Cuckoo continued to deposit one of hers among them, and left it to the care of the Sparrow. This addition to her charge rather disturbs the Sparrow's arrangements, and during the time of incubation she occasionally either throws out her own eggs, to make room for that of the Cuckoo, or she so injures, as to addle them ; but it is a curious circumstance that she never throws out or injures the egg of the Cuckoo. After the usual time of sitting, when some of her own eggs and that of the Cuckoo are hatched, the young Cuckoo manages to turn out both the young Sparrows and the remaining eggs, and gets the whole nest to itself.

MUSOPHAGA—Banana-eater. All the Banana eaters, which have in one instance been improperly called *Plantain-eaters*, belong to Africa, and feed on the two species of Banana, *Musa Paradisiaca* and *Sapientum* ; they fly sluggishly, and move their wings very frequently without making much progress ; but they vault from branch to branch of the forest trees, among which they live, with great agility, and run up their trunks with much quickness. They build in hollow trees ; both male and female participate in the process of hatching, and their young ones follow them a considerable time. There are six species.

PHENICOPHAUS (Gr. φαινίξ, *red*, and φάος, *an eye*). This genus, which consists of four species, was included among the Cuckoos till separated from it by Le Vaillant under the title of *Malcoha*, by which name one of the species is known in Ceylon. It is distinguished from them by its strong and much-curved beak, and by the nostrils being placed near the edges of the upper mandible, which is very strong ; around their eyes is a bare circle covered with little elevated papillæ, in their appearance resembling velvet ; the head is square and larger than in the Cuckoos, which, however, they otherwise resemble in the form of their body, the shortness of their wings, and the gradation of their tail. They feed only on fruit.

POGONIAS (Gr. πώγων, *a beard*)—*Toothbill*. The individuals forming this genus were included among the *Buccones* till separated by Illiger, on account of the different form of their beak. All of them are natives of Africa. Eight species.

PTEROGLOSSUS (Gr. πτερόν, *a feather*, and γλῶσσα, *a tongue*)—*Aracari*. This genus, formed by Illiger on account of the feathering of the edges of

its tongue, makes part of the *Ramphasti* of Linnæus, from which, however, it is further distinguished by the beak being of smaller size, more tough and solid, and by the tail being proportionally longer and distinctly graduated. Like the *Toucans* they are natives of South America, and fly heavily; but notwithstanding they get to the tops of the highest trees, where they are fond of perching, and continue throughout the day in constant motion, carefully watching what is passing below them. They feed on fruit, and occasionally also on young birds. When about to swallow their food they give it a jerk into the air, and catch it open-mouthed. Eight species.

RAMPHASTOS (Gr. *ράμφος*, a beak)—*Toucan*. This genus is remarkable for the great size of its bill, which in some species nearly equals the length of the body; but though bulky it is light, being made up of a delicate bony texture covered with thin horn, and its edges are serrated or toothed like a saw; it differs according to the species in the greater or less convexity of its sides, the sharpness or roundness of its culmen or upper edge, and the smoothness or jaggedness of its cutting edges; it also varies as to size and colour according to age, even in the same species; the naked space around the eyes, except in three species, in which it is crimson, is of a slaty-blue, which also colours the legs. Their tails are short and square, which distinguishes them from the *Aracaris* (*Pteroglossus*). Their form is narrow and slender, but the size of their bill and the shortness of their tail give them, when at rest, a clumsy and sluggish appearance, which, however, is immediately lost when the bird is roused, its motions being then easy and elegant. They have great similarity in colour, which has given rise to confusion of the species; their general colour is black, but in all the known species the throat, upper and under tail-coverts differ from the ground colour; the front of the neck and upper part of the chest are either white or yellow, bounded below by a crimson band varying in breadth and sometimes covering the whole chest; the under tail-coverts are always crimson, and the upper either crimson, white, or yellow.

This remarkable genus of birds is strictly confined to the tropical regions of South America, where it occupies the same station as the Hornbills in Asia and Africa, and the Rain-bird in New Holland.

In the "Zoological Journal," vol. ii., a very excellent paper has been given by Mr. Vigors, in which the confusion involving many of the species has been satisfactorily cleared. And this has been more completely followed up by the arrangement of the genus in sections by Mr. Gould in his "Monograph of the *Ramphastidæ*."

SCYTHROPS—*Channel-bill*. One species found in New Holland and in the Southern Archipelago. Its length is about twenty-five inches, and it feeds on the seed of the red gum and peppermint tree.

TAMATIA—*Puff-bird*. The Puff-birds, which generally measure eight inches in length, are natives of the Brazils, and acquire their English name from their large, bulky head being rendered still larger by raising the feathers and giving it the appearance of a puff-ball; but, when frightened, the form of the head is altered by the sudden flattening of the feathers. Throughout nearly the whole day they sit motionless on the branch of a dead tree, except when an insect comes within their reach, upon which they raise the head-feathers, and darting upon it, immediately return to the same branch, upon which it is said they will sit for months. If compelled to leave their retreat in search of insects, upon which they principally feed, their whole manner exhibits great timidity, and they are continually ducking down to avoid discovery. Five species.

TROGON—*Couroucou*. "Splendour and brilliancy of plumage," says Temminck, "are indeed the only gifts in which the *Couroucous* participate; elegance of form, nobleness of gait, quickness of flight, docility and sweetness of manner, they have not." Their abundant plumage is very slightly connected by its delicate quills to an exceeding thin skin, so that the slightest touch detaches considerable portions of it. Their irides are dusky and scarcely visible, and the edges of the eyelids always coloured. Their tail is narrow, long, and graduated. They are found in both the old and new world; all those of the latter being distinguished by many delicate denticulations along the margins of both mandibles, whilst the former have but one. During the daytime they sit perched on a branch of thick underwood,

and are scarcely visible, and even when observed do not take to flight, but allow of being approached without fear and are easily taken. D'Azzara says they do not descend from their perch, but quietly sit and snap up such insects as come within their reach. They feed also on some soft succulent fruits, and only leave their cool and shady retreat at early morn and evening. Their breeding-time occurs frequently during the year, and at these periods the male leaves his solitude and utters a doleful cry, somewhat resembling its name *couroucou*. The species are twenty, divided into two subgenera—denticulated and non-denticulated beaks.

Family—PARROTS; *Psittacida*.

These Birds are of beautiful plumage: they belong to the torrid zone, and the species are very numerous. They have strong beaks, rounded, and curved; their tongue is thick, and fleshy; and they have a complicated and muscular inferior larynx. They climb well, using both their claws and hooked beaks, and some of them their tails, for that purpose.

ILLUSTRATIVE EXAMPLES.

PLATE 8.

Genus—PSITTACUS.

Sub-Genera.	Species.	Common Name.
Ara seu Macroceros -	Aracanga - - -	Scarlet Macaw.
Conurus - - -	Solstitialis - - -	Angola-yellow Parrakeet.
Psittacula - - -	Pileatus - - -	Bonneted Psittacule.
Psittacus - - -	Erythræus - - -	Gray Parrot.
Ptyctolophus - - -	Nasicus - - -	Long-nosed Cockatoo.
Microglossus - - -	Goliath - - -	Gray small-tongued Parrot.

CHARACTERS OF THE GENERA.

PSITTACUS (Gr. *ψιττάκη*, a Parrot). Beak convex above and below, compressed, short, thick, large and strong, and curved from the base; upper mandible very much hooked at the tip, more or less pointed; lower mandible short, obtuse, and turned upwards at the tip, which is often worn away and exhibiting two points; tongue, in most, thick, round, and fleshy; nostrils basal, roundish, patulous, and placed in the cere; wings not of great length but strong; of variable form and length; legs short and strong, the tarsus generally much shorter than the outer toe; front toes connected at their base; the soles of all the toes wide.

This very numerous and highly-interesting genus of birds is spread extensively over the earth, being found between 42° of north and 55° of south latitude, increasing greatly in number as it approaches, and diminishing as it recedes from the Equator, so that the species found in the extreme northern and southern latitudes are very few.

Parrots, in general, feed upon kernels, rarely meddling with the fruit except to get at the kernel. One section of them, however, which are found in Australia, differ in this respect, as they suck the vegetable juices like many other New Holland birds, and have a peculiar kind of tongue for the purpose. In domestication they may be taught to eat almost everything, and even meat and bones. But the habit of eating meat often leads to serious consequences, as when the bird cannot obtain this, which occasionally becomes its favourite food, it will pluck its own feathers and suck the stems, till it has pulled off all its feathery covering, except the wing and tail quills, which would give it, if plucked, rather more pain than it could very well bear. According to Vieillot, this habit arises from a morbid itching of the skin, which induces the Parrot to pull out its feathers, and does not depend on the kind of food upon which it has been fed. As to fluids they take but little, but are easily taught to drink wine, of which they soon become very fond, as was long since noticed both by Aristotle and Pliny. Although living together in large societies, each male has its own female, by which he is always seen perched; and at breeding-time each pair chooses its own particular residence apart from the others, in the hollow either of a tree or rock, where the hen-bird makes her nest of dried leaves, moss, or fragments of rotten wood. Four eggs are laid, and the male, as well as the female, assists in the process of incubation. When

first hatched, the young Parrots are entirely featherless, and covered only with a dingy white down, from which, in the course of four or five days, the tubes of the feathers protrude. At the end of six weeks the feathers having burst their tubes, the whole body is entirely fledged; but the young birds still remain in the nest, although nearly as strong as the parent, and having their wings almost fully developed; if they venture to leave the nest it is merely to perch on a neighbouring tree, where they are fed by the old birds till they are two months old; when, having attained their full growth, and become capable of feeding themselves, they accompany their parents to be taught the kind of food on which they are to subsist. So soon as they have acquired this knowledge, the old birds drive them off, and the younger and older members of this society form two distinct companies which do not intermix, and are readily distinguished by the sportsman, the former being very easily, the latter with great difficulty, surprised or approached.

The colours of Parrots are generally very brilliant and distinct; the female differs in plumage from the male, as do also the immature birds for two or three moults. Green is mostly the prevailing colour, next red, blue, and lastly yellow; the latter of which is considered by Dumeril to occupy the place of white in most other birds.

Parrots live to a very advanced age: a bird of twenty or thirty years old is by no means uncommon; but, perhaps, the most remarkable as to longevity which is on record, is that of a variety with a yellow tail of the *P. Erythracus*, (Plate 8,) mentioned by Le Vaillant in his History, and which was known to have been domesticated for seventy-three years.

The facility and distinctness with which Parrots generally learn to talk have rendered them favourites with both polished and unpolished nations from a very early period. But there is little chance of making the bird a good talker unless it be taken very young; as when more advanced in age they can be taught but little, and that with great difficulty. All Parrots, however, will not learn to talk; some are unable to articulate other than their natural note; others will acquire a few words and no more; but those which talk best are the Amazon and the Grey Parrot.

This extensive genus, which consists of nearly two hundred species, is arranged into six sections, with their generic distinctions; thus leaving it quite optional with the student to retain them in a single genus or to break them up into several genera.

Section 1. *Ara* (*Macrocerus* of Vieillot). Beak strong, height from the chin to the forehead doubling the length from the gape to the tip; under mandible bent inwards; face naked or marked with feathery lines; tail longer than the body, much graduated and pointed.

The *Scarlet Macaw* (*P. Aracanga*), Plate 8, is a species of this division: it is two feet and ten inches in length; the cheeks bare and wrinkled; general colour scarlet; greater wing-coverts yellow, tipped with green and blue; alar quills blue above and red beneath; lower part of the back and rump light blue. Common in Guiana and at Surinam.

Section 2. *Conurus*. Tail of unequal length with the body, graduated and pointed, but never square; beak of moderate size; face feathered except in the first division, in which the ocular circlelets are naked. All of them are natives of the torrid zone.

One species, the *Angola Yellow Parrakeet* (*P. Solstitialis*), Plate 8, is about eleven inches long; the general colour of the male is reddish-yellow or orange, glossed here and there with jonquil; beak blackish at its base and tip, and grey in the intermediate space. It is found in Angola.

Section 3. *Psittacus*. Tail much shorter than the body, rounded, sharp; beak of moderate size; face feathered; body of small size. They are found throughout the torrid zone.

The *Bonneted Psittacule* (*P. Pileatus*) varies from eight to nine inches long; beak red; general colour brilliant green; ocular circlelets bare and white; head and fore part of the neck black; hind part of the latter ochrish-orange; and each feather having a dusky edge; chest ochrish-olive; alar quills black, edged externally with green; tail shortish, and tipped with blue. The female has the head blackish-green. It is found in Guiana, but is a rare species.

Section 4. *Psittacus*. Head large, not crested; beak strong and hooked; face feathered; body bulky; and tail short and square.

They are all natives of the torrid zone; and, according to Humboldt, the American species live in large societies.

Under this section the *Grey Parrot* (*P. Erythracus*) is found: it measures about twelve inches in length; general colour ashy-grey of varying shade, and the edges of all the feathers edged with a lighter tinge; lower part of the belly and sides white; tail red above and beneath, and the shafts of its feathers black; beak, legs, and tips of the primary alar quills black; ocular circlelets and lore naked and covered with whitish powder. Is a native of the western coast of Africa. It is the species most commonly domesticated in Europe, as it talks extremely well, and becomes much attached to its keeper. It is said to live a hundred years.

Section 5. *Ptyctolophus*. Beak generally large, bulky, and much curved; ocular circlelets bare; head furnished with a folded or pendulous crest; tail short, square, and even-ended. They are found both in India and New Holland.

The species *P. Nasicus*, or *Long-nosed Cockatoo*, (Plate 8,) is about fifteen and a half inches long, and remarkable for the great length of its upper mandible; it has also a very small frontal crest. Its general colour is white, except the rose-coloured tint of its face, which becomes slightly tinged with red about the ocular regions; belly and under tail-coverts reddish-yellow; base of the caudal quills yellowish; beak and legs ashy. Is a native of New Holland.

Section 6. *Microglossus*. Beak very much curved; tongue short, resembling an oval tubercle; head furnished with a crest of narrow feathers; the face naked; tail square and even at its tip. All natives of Asia.

The *Grey Small-tongued Parrot* (*P. Goliath*) is more than two feet in length; beak four and a half inches in length, and black; crest long; general colour grey. Is a native of the East Indies, and forms the intermediate link between the Aras and the Cockatoos.

ORDER IV.—GALLINACEA. SCRATCHERS.

THIS Order is so named, on account of the affinity subsisting between the principal Family, *Gallinida*, and all the other Families. None of them sing: they are heavy birds; their wings are short; and their stomach is a very muscular gizzard.

Family—POULTRY; *Gallinida*.

This Family includes not only the Domestic Cock and Hen, but the Pheasants, Turkeys, and other Families more or less related to them in structure and habits.

ILLUSTRATIVE EXAMPLES.

PLATE 9.

Genera.	Species.	Common Name.
Gallus - - - -	{ Sonnerati - - - -	Sonnerat's Cock.
	{ Macartneyi - - - -	Crested Cock.
Phasianus - - - -	{ Amherstiae - - - -	Amherst's Pheasant.
	{ Nycthemerus - - - -	Silver Pheasant.
Tragopan - - - -	Satyrus - - - -	Nepaul Horned Pheasant.
Cryptonyx - - - -	Coronatus - - - -	

Other Genera of this Family:—Hemipodius, Lophophorus, Meleagris, Numida, Opisthocomus, Pauxi, Pavo, Penelope, Perdix, Polyplectron, Pterocles, Syrrhaptes, Tetrao, Tricanus.

CHARACTERS OF THE GENERA.

1. GALLUS. Beak moderate-sized, conical, and arched; nostrils basal, lateral, and expanded, but half closed with membrane; forehead generally furnished with a fleshy crest or comb, extending to the nose; cheeks wattled, a single fleshy process descending on each side below the mandibles; legs provided with arched spurs; four toes, three before and one behind, a membrane extending as far as the first joint of each; claws

hooked, but broad and blunt, fit for scratching; the first three primary quills shorter than the others, the first shortest of all.

2. PHASIANUS (Gr. *φάσις*, a river of Colchis). Beak of moderate size and strong, base naked, upper mandible vaulted, convex, and curved towards the tip; nostrils basal, lateral, and covered with an arched membrane; cheeks naked and warty; wings short; tail much graduated, conical, and consisting of eighteen quills; legs in the male armed with a conical spur; three toes in front connected by membrane to the first joint, one toe behind.

3. TRAGOPAN (Gr. *τράγος*, a Goat). Beak large, short, strong, and much curved; upper mandible rather swelling, lower straight; nostrils basal, lateral, covered with the naked cere, and half closed by a large membrane; in the male the head is crested; behind and above each eye a slender fleshy horn curving backwards and downwards; throat naked and wattled; the female has neither fleshy horns, wattles, nor nudities; wings short; legs strong and short, in the male armed with spurs; claws long and straight.

4. CRYPTONYX. General characters same as those of the Pheasants; the hinder claw is, however, wanting, and the tarsi are without spurs.

The general characteristics of the "other genera of this family" follow the "Description of the Species" contained in the Illustrations.

GALLINIDA.—DESCRIPTION OF THE SPECIES.

GALLUS—Cock. The *Domestic Cock* (G. *Domesticus*) is too well known to require a minute description. He is remarkable for the stateliness of his gait, his courage, and vigilance, and his attention to his feathered mistresses, which commence when he is about eight or nine months old. He is extremely jealous, and very irascible, and, so long as he has strength, will not permit the intrusion of any stranger into his domestic circle; hence originate the frequent combats which an ill-managed poultry-yard presents. The disposition to fight is shown more especially among Cocks which have not lived together in the same yard, as if to try their strength. But their courage is often exerted in defence of their Hens against other birds.

The Cock generally becomes old and useless in the course of three years, but those which are of larger size last much longer, as they do not come so early to maturity. In his habits he is particularly clean, being continually occupied in trimming and ordering his feathers with his bill. And although his crowing is not the most melodious music, he takes especial care to be the loudest, and outcrow if possible, any neighbouring Cock; for which purpose he may be seen listening with attention, and if he be answered, replying in a shriller and louder note of defiance than before: this is repeated many times, till one or other is tired, or fairly beaten.

The Hen, like the Cock, is furnished with a comb and wattles, but of less size, and less brilliant hue than his. She is, as is generally the case with birds, smaller than the Cock, and her plumage more sombre: her tail, although vertical, is not ornamented with the long feathers which peculiarly distinguish him: neither does she crow, nor make any noise, but that known as *clucking*, which is generally indicative of her having laid an egg, except a harsh scream, which is common to both Cock and Hen when they are frightened. Amongst themselves Hens are extremely quarrelsome and violent, and if they find one which is either weak or maimed, attack her in a body, and frequently destroy her. Her fecundity is very great, and she will commonly lay two eggs within every three days throughout the greater part of the year, except moulting-time, which occupies two months. After having laid about twelve eggs, she prepares for sitting, a period which may be distinguished by her cries and great uneasiness, and from the time it commences, occupies twenty-one days, during which time she rarely leaves the nest; and, after the eggs are hatched, attends her little progeny with the utmost care and attention, leading them about, finding food for them, and collecting them under her wings on the slightest appearance of danger. During this time she becomes exceedingly courageous, and will face almost any animal who molests her in defence of her young.

It is observed that Fowls breed more freely in warm than in cold climates, although even in the latter they live and thrive: they are not

found in the northern parts of Siberia, and are kept in Greenland only as rarities.

Sonnerat's Cock (G. *Sonnerati*), Plate 9, is about two feet four inches in length, from the tip of the beak to the extremity of the tail; it is therefore about a third larger than our Domestic Cock. These birds are remarkably distinguished from every other species of Cock, in the size and flatness of the quill of the feathers on the head and neck, forming a white stripe throughout the whole length of the feather to the tip, where it becomes expanded into a round film of a cartilaginous structure, very delicate and highly polished. The female, always smaller than the male, has neither comb nor wattles, and the throat is covered with feathers, in both which points it differs strikingly from our Hens; the plumage of the under parts resembles that of the Cock, but the colours are duller. These birds are found wild in the woody plains of Hindūstan; they strut along boldly, and fight with great fury.

The *Crested Cock* (G. *Macartneyi*) is about two feet long; beak yellow; the head is ornamented with a tuft of feathers deprived of their barbs, except at the tip, whence arise numerous small barbs, which are distinct, and expand like a fan; a naked, thick, violet-coloured membrane, which forms the prolongation of the nostrils, extends over the sides of the head, and encircles the eyes; it rises up around the root of the beak, and forms a loose membrane, which passes towards the occiput, and below each eye produces a little process or beard; the upper and under parts black, with shades of violet; the feathers on the sides edged with bright red; wing-coverts black, edged with golden green; the broad feathers of the rump are of a golden red, or colour of fire; they are shaded with coppery rose colour, and clouded with purple and violet, which also colour the upper tail-coverts; the four middle quill-feathers are of a bright red, and arched, the others black; legs grey, nails and spurs brown. The males generally carry the tail in a horizontal position, but they often raise it; its two planes are not so vertical as in the common Cock. This beautiful bird was first mentioned by Sir George Staunton, in his account of the Embassy of Lord Macartney to China; it was met with at Batavia, in a menagerie, but is found wild in the forests of the Isle of Sumatra.

PHASIANUS—Pheasant. Pheasants and Cocks were considered as belonging to the same genus, till the latter were removed by Brisson from the former to constitute a new genus under the title *Gallus*. Pheasants are distinguished by the bare patches on the sides of their head; their tail is long, narrow, and arching, and the middle two quills of much greater length than the others. Their gait is different from that of the Cock, which carries its head and neck erect, whilst the Pheasants stoop, and extend their neck forwards. They are also less hardy, and cannot be brought up in confinement without great care, instead of thriving like Fowls with little trouble. The male Pheasants are remarkable for the beauty and brilliancy of their plumage, are often furnished with crests, and their tails are very long; the plumage of the female is more sombre, she never has any crest, and her tail is always shorter. They are polygamous, and make a trifling nest among the grass or in bushes. Pheasants are found in Asia and Europe, but neither in Africa nor America.

The number of species is twelve, of which two are figured on Plate 9, viz., the *Silver or Pencilled Pheasant* (P. *Nycthemerus*), and *Amherst's Pheasant* (P. *Amherstiae*).

The former is about two feet eight inches in length; the wings when closed do not reach beyond the origin of the tail, which is long and very cuneiform. Upon the head is a long crest of purplish-black, decomposed feathers, falling back; the white plumage of the upper parts of the neck and body is marked obliquely with very delicate black streaks; the front of the neck and under part of the body purplish-black; wings and tail white streaked with black, except the middle two caudal quills, which are quite white; the irides reddish-yellow; beak yellowish, but inclining to brown at its tip; legs bright lake, and the long sharp spurs white. The female is of smaller size than the male. This species is a native of the northern parts of the Chinese empire; but it has been introduced into almost all the countries of Europe, where, as it requires little more care than common

poultry, being the hardiest of the Pheasants, it has thriven well, and is commonly called the Silver Pheasant. They pair towards the end of April, and the female lays from eight to fourteen eggs, brownish-yellow inclining to white, and spotted with brown. This species connects the *Phasian* with the *Galli* by the form and disposition of its tail feathers, and especially with the *G. Macartnei*.

The general form of *Amherst's Pheasant*, and the arrangement of its plumage, and the tail, are similar to those of the *Golden Pheasant*; the top of the head is green, the crest feathers are crimson, and two and a half inches long; the pendent tippet white, and each feather marked with a dark green circular band, and with a similarly coloured straight band near the tip; neck, back, shoulders, chest, and wing-coverts metallic-green, and each feather tipped with velvet-black; tail-coverts brown at the base, their centre barred with green and white, and tip scarlet, and as they approach the caudal quills become elongated to ten inches; the first caudal quill is twenty-nine inches long, barred with green on a mottled-white ground, the third and fourth measure thirty-eight inches, their inner web narrow, and mottled with black and white, their outer much wider, and marked with transverse, circular, dark-green bars on a ground the inner part of which is greyish-white, and the outer light chestnut-brown. From Cochinchina.

TRAGOPAN. This genus of birds is intermediate to the Turkeys and Pheasants, but in their general form correspond more closely to the latter. They are, however, remarkably distinguished by their wattles, and by the fleshy horns arising from the sides of the head. They are natives of the mountainous districts of India and China.

The *Nepaul Horned Pheasant* (*T. Satyrus*) measures from twenty to twenty-three inches in length; beak brown; in the *male*, the head furnished with a crest of long narrow feathers, of which those from the front and summit are black, and from the hind head rich scarlet maroon; naked ocular circle, fleshy horns, and wattles mingled blue, purple, and red; throat, sides of the head, and nape black; neck scarlet maroon; back and upper surface olive-brown, barred and zigzagged with black, and irregularly spotted with white; shoulders wood-coloured or scarlet maroon, as are also the whole under surface, but numerous marked with white spots encircled with black; quills and tail blackish-brown; legs light brown. It feeds on grains, roots, the larvæ of ants, and other insects.

CRYPTONYX. There are four or five species, of which the *C. Coronatus* (Plate 9) is the most prominent, because the best known; they are all natives of India and its islands. They are nearly related to the Pheasants in appearance and habits; the circumference of the eye is naked; the tail is of moderate length, and plain; and in the male of the illustrated species a crest of long thinly-barbed rufous feathers rises from the head, and a few long barbless stems spring up over each eyebrow. Its plumage is bright green and blue; whilst that of *C. Niger* is wholly black.

HEMIPODIUS (Gr. ἡμιπους, *half*, and πούς, *a foot*). This genus of birds, described by Laccpède under the name *Tridactylus*, and by Illiger under that of *Ortygis*, was included by Linnæus among his *Tetraones*, and by Latham in the *Perdices*. They are the smallest of gallinaceous birds, not being larger than a Thrush, and more nearly resemble the Quails, from which, however, they are remarkably distinguished by their short tails, consisting of ten quill-feathers. There is but little difference between the male and female plumage. They are polygamous, but both young and old birds are solitary; they feed principally on insects, and are found on barren lands; two or three species in the southern parts of Europe, but the greater number in the warm regions of Asia and Africa. They do not fly much, but run with great speed; and when pursued, commonly hide themselves under any tuft of grass which may be in their way. The species are about ten in number.

LORIPHORUS (Gr. λόφος, *a crest*, and φέρω, *I bear*). This genus is distinguished from the Pheasants, among which it had been placed previous to Temminck's arrangement, by the much greater length of the upper mandible, which completely hides the lower. The legs are very remarkable in being feathered not only to the knee, but in having a feathered stripe extending down the inside of the tarsus to the root of the spur; the claws are long

and slightly arched, that of the middle toe is nearly three-quarters of an inch in length.

MELEAGRIS—Turkey. There has been much difference of opinion as to the region from whence Turkeys were first brought into Europe; the earlier ornithologists, as Belon, Ray, and Willughby, consider them to have been derived from Asia; but subsequently Buffon and others have denied their existence as indigenous to Asia, and have affirmed that they were imported by the Spaniards from America. Of Turkeys there are known but two species, both of which, in their wild state, are natives of America, one of which forms the stock of our domestic bird.

The domestication of the Turkey has produced several varieties; the most rare is the *Tufted Turkey*, of which the crest is sometimes white, at other times black. Sometimes the whole plumage is entirely black, sometimes white, at other times speckled, and these varieties are continued by breeding; but a white or speckled Turkey is never met with in the wild state. Cross breeds between the domestic and wild Turkey often occur in those districts where the birds are common, and such are preferred for the table as combining the fat of the former with the flavour of the latter.

Wild Turkeys are not very particular in their food; they eat maize, berries, fruits, grasses, beetles, and even tadpoles, young frogs, and lizards, but where it is to be had they prefer the pecan nut, and more especially the acorn, on which they fatten rapidly. When the crop of acorns is very great in a particular district, they are attracted to it from their usual haunts in great numbers. About the beginning of October they assemble in large flocks on the Ohio and Mississippi, and hence this is called by the Indians the *Turkey Month*.

Turkeys in the domestic state are polygamous, one male being sufficient for twelve or fifteen females; the hens of two or three years old are most careful of their brood. The hen Turkey lays about twenty-eight eggs, twice a year, viz., in February and August, where the temperature is mild, but in colder districts only once a year, in March or April. The eggs are laid every other day, and when the hen has ceased she begins to sit; those which had been previously taken from the nest are then to be returned to it; but sixteen, or at most eighteen, are as many as she can manage, and care should be taken that the first two which have been laid should not be included among these, as they are generally unfruitful. She sits twenty-seven or twenty-eight days, and during that time food should be placed by her, or she will be liable to starve herself, from her indisposition to leave the nest.

NUMIDA—Pintado. The birds composing this genus are natives of Africa, but some of them are now spread over almost the whole globe: they live wild in the southern part of the African continent, congregating in large flocks during the daytime about the marshes and rivers in search of food, and at night roosting in the forests. The partial webbing of their feet adapts them to the marshy districts in which they feed; but the shortness of their wings prevents them from flying well or to any great distance. They feed on land and water insects, worms, snails, &c., and destroy buds and flowers. They utter a shrill note similar to the creaking of a door on its hinges, and are very restless and quarrelsome.

The species are—the *Guinea*, *Mitred*, and *Cornal Pintado*.

There can be no doubt that the Guinea Pintado is the bird which was known to the Greeks and Romans by the name *Meleagris*, which, however, has been applied wrongly by the older naturalists as the generic title of the Turkeys, and has been so firmly established by use, that confusion only would be excited by attempting any change. The following description of the *Meleagris* given by Athenæus, after Cletus Milesius, a disciple of Aristotle, is strikingly characteristic of the Guinea Fowl, or Pintado: he says, "They want natural affection towards their young; their head is naked, and on its top is a hard, round body, like a peg or nail; from its cheeks hangs a red piece of flesh like a beard; it has no wattles like common poultry; its feathers are black, spotted with white; it has no spurs, and both sexes so nearly resemble each other as not to be distinguishable at sight."

OPISTHOCOMUS (Gr. ὀπισθεν, *behind*, and κόμη, *hair*)—*Sasa*. There is but one species; rejected by Temminck from the gallinaceous birds, but retained by Cuvier. It is about the size of a Peacock; has on the back of

its head a crest, reaching down to the middle of its neck, which it raises when excited. Native of Guinea.

PAUXI. This, together with the genera *Crax* and *Penelope*, occupy in the new the place of the Pheasants in the old world. They live in great numbers in the spacious forests of South America; and, when domesticated, are quiet, and live on peaceable terms with other poultry. Their gait is slow, though they can run with great speed. The upper mandible is remarkable for an elevation which forms part of the jaw itself, and is covered with a continuation of the horny beak; in one of the species it is somewhat globular, and in the other broad at the base and sharp above; immediately behind this crest are placed the nostrils, partly covered with skin, and opening below.

PAVO—Peacock. Peacocks are remarkable for the brilliancy and variety of their colours, in which they vie with the Humming Birds, or other of the more lustrous birds of hot climates. Their head is ornamented with a tuft of feathers two inches in length, the stems of which have but few and scattered barbs, except at their tips, where they are full and close as usual. The tail is of great length and width; this, however, does not depend, as is generally the case, on the length of the tail-quills, but on that of the upper tail-coverts, which far exceed the former; they are capable of being expanded to a considerable extent in a circular form, either in a horizontal or in a vertical direction, and in either case the quills beneath seem to support them like a framework. When pleased or delighted, the Peacock erects his tail and stalks about with a slow and majestic pace, frequently turning himself round in a composed and graceful manner, so that the light may better display the rich colours of his resplendent plumage. When disposed for quiet, they generally perch on a high wall or among the branches of trees, where they roost for the night.

There are two species, the *Wild* and the *Japan Peacocks*. From the *Wild Peacock* (*P. Cristatus*), the stock of our Domestic Peacock, three varieties have sprung: 1, the *Domestic*; 2, the *White*; 3, the *Variegated Peacock*.

In their natural state, Peacocks exist only in the south of Asia and in the Indian Archipelago, whence they have been spread over the warm and temperate parts of the globe.

PENELOPE. Although this genus in many respects resembles the *Hoccos* and the *Pauxis*, still they exhibit some marked peculiarities. Instead of collecting together in large coveys, as the just-mentioned two genera, they, with the exception of a single species, live only in pairs, and are very rarely met with in larger numbers; for, so soon as the young birds can fly, they leave the parent and become scattered about in the woods. They are about the size of a Pheasant, have the tail long, slightly graduated and rounded, and consisting of twelve quills. They build in trees; and before the young are fledged they leave the nest, and having reached the ground, feed on worms and insects, and subsequently on grain. In their general habits they bear much resemblance to Pheasants, coming out to feed morning and evening, but hiding themselves during daytime in thick coverts to avoid the heat of the sun. There are five species.

PERDIX—Partridge. The numerous individuals included in the genus *Perdix* are arranged in four groups; the first two from the arming of their legs, the third from the form of the beak, and the last from the form of the beak and the length of the first alar quill. The first subgenus consists of the *Francolins*, the males of which have their legs armed with spurs; they live among the marshes and swamps on the borders of rivers, and generally collect together at night and perch upon trees; their food is principally the roots of bulbous plants, which, growing in a hard soil, require the mattock-like beak possessed by these birds to dig them up. The *True Partridges* form the second subgenus, and are characterised by the callous tubercle which arms the legs of their males; they are never found in forests, but are inhabitants of meadows and plains, and they very rarely, but never constantly, perch; they live in families which are called *coveys*, and, collecting together at night, huddle together on the ground within a very small space; their food is green wheat, various kinds of grain, seeds, and insects. The third subgenus, the *Colins*, forming the new

genus *Ortyx* of Stephens, have neither spur nor tubercle on their legs, but their beak is much deeper than it is wide, and sometimes the upper mandible has upon it a blunt tooth. All these are natives of America. Like the *Francolins*, they perch among the trees at night to protect themselves from the attacks of reptiles and other carnivorous animals, and for the same reason they build in trees, which neither of the preceding subgenera do. The *Quails* compose the fourth subgenus, the principal distinction of which consists in the first alar quill being always the longest, whilst in the others the first three are the shortest, and the fourth and fifth the longest; the beak also, though still compressed, is wider than it is deep. Most of them are migratory. Species about thirty-eight.

POLYPECTRON (Gr. *πολύς*, many, and *πτερόν*, a spur). The *Polypectron* does not elevate the tail like the Peacocks, nor has it the large dorsal feathers of which the Peacock's expanded tail is composed; its tail is wide, rounded, and not at all arched; by the temples being unprovided with the velvet-like feathers; and by its legs being always furnished with more than one spur, and varying from six to four, two of which are sometimes connected to one base; the most usual number of spurs is three, the most rare six.

PTEROCLES (Gr. *πτέρυξ*, a wing)—*Ganga*. This genus is considered by Temminck as representing the *Tetraones*, in the countries under the torrid zone, but distinguished from them by their slender form, by the lightness of their body in proportion to their limbs, by the strength of their muscles and the length of their wings, an organization suited to their long-continued flights; whilst their wide and short toes, with the elevation of the hind toe above the ground, render them able to run with speed over the moving sand. They are found, with the exception of one species, in the hot countries of Asia and Africa, and are only accidentally seen in Europe. Happy does the traveller consider himself when, toiling over the scorching deserts, he meets with the *Gangas*, which indicate his approach to streams and fountains of water. Living on the borders of the desert, either in brushwood or on the dry plains scantily studded with bushes, they run daily over a considerable extent of ground in search of their accustomed watering-places, and when these natural cisterns, or the streams which feed them, are dried up, the *Gangas* do not hesitate to journey across the shifting sands which most animals fear to encounter, and which all other birds of this country avoid by passing along the coast. Some of them live throughout the year, except at pairing-time, in large flocks, sharing alike their dangerous migrations or the abundance which occasionally they meet with; but others of them, like the *Partridges*, live only in pairs with their brood. There are ten species.

SYRRHAPTES (Gr. *σὺρραπτω*, to sew together). This genus is so different from the other *Gallinaceæ* that Cuvier thinks it doubtful whether it belongs to the order; it is founded on a species of Grouse discovered by Pallas.

TETRAO (Gr. *τετράων*)—*Grouse*. The *Tetraones* belong specially to the northern parts of the globe, being found only in the north of Europe, Asia, and America; their place is occupied in the sandy regions of Asia and Africa by Temminck's *Pterocles*, or Land Grouse. The several sections of the *Tetraones* themselves affect particular districts, and have somewhat peculiar habits, although generally polygamous. Except during breeding-time, all the species keep on the ground, in the deepest parts of the forests, during daytime, but at night they roost in trees, to which also they resort if disturbed. After having paired, and produced eggs, the males desert the females, and generally live apart, the hatching and bringing up of the broods being left completely to the hens. They feed almost entirely upon buds, berries, and the young shoots of pines, spruce, and birch, and occasionally, when these fail, on grain. The young are fed on worms, insects, and ants' eggs, of which they are very fond. The *True Grouse*, distinguished by having the legs feathered down to the toes, are distributed over the more temperate climates, living in deep forests in mountainous districts, the male bird usually alone, and the female with her brood apart from others. The toes of these sections have their under-surface rough and scabrous, with a pectinated or tooth-like row of processes on each side, which enables them to tread more firmly on the slippery ground or frozen

snow, and to grasp more tightly the branches of the ice-covered trees. The *Ptarmigans*, on the contrary, which have their legs and toes feathered to the claws, and even on the soles of their feet, are inhabitants of the polar regions, for which the thick down beneath their feathers admirably suits them; they alone, of the whole genus, live in large flocks, and only separate in pairs when breeding-time comes round with the spring.

The bodies of the whole genus are large and fleshy, are highly valued for the pleasure they afford the sportsman, as well as for the table; and they have generally a peculiar flavour from the food on which they live. About eighteen species.

TINAMUS. This genus was formed by Latham; but subsequently its name has been changed by Illiger into *Crypturus*, on account of its tail being concealed by the coverts: Latham's generic name is, however, very generally employed. They almost invariably live in thick woods, running about during the day among the underwood, rarely fly, and then only for a short distance, but some are found among the high grass in the open fields. At night they usually roost on the lower branches of trees, where, hidden among the foliage, they are protected from the assaults of their four-footed or winged enemies. Species about eighteen.

Family—PIGEONS; *Columbida*.

The Pigeons form a connecting link between the *Passeres* and *Gallinacea*.

ILLUSTRATIVE EXAMPLES.

PLATE 10.

Genera.	Species.	Common Name.
Columba - - -	Carunculata - - -	Carunculated Pigeon.
	Coronata - - -	Crown-bird or Crowned Pigeon.
	Enas - - -	Stock-dove.
	Leucocephalus - - -	White-headed Pigeon.
Vinago - - -	Wallia - - -	Abyssinian Pigeon.
	Calva - - -	Bald-fronted Pigeon.

CHARACTERS OF THE GENERA.

1. **COLUMBA** (Gr. *κολυβάω*, to swim). Beak moderate-sized, thin, vaulted, slightly compressed, with a soft bulbous projection at its junction with the jaws; toes distinct, four in number, the inner the longest; tail having twelve quills.

2. **VINAGO.** General characters same as the *Columba*, or restricted Pigeons; their bill is stouter and more solid, and is laterally compressed; tarsi short; feet large.

COLUMBIDA.—DESCRIPTION OF THE SPECIES.

COLUMBA—Pigeon. This genus, which is very numerous, and which furnishes so many of our poultry yards, may be considered as an easy gradation from the *Gallinacei* to the *Passeres*; they have the arched beak of the former, and the nostrils are situated in a broad membranous space, at the root of the beak, and covered by a cartilaginous scale, which is prominent, and forms a bulbous projection at the junction of the beak with the jaws; the toes have no membrane at their base, but that produced by the junction of their edges; the tail is composed of twelve quills. They are very good flyers, and perhaps the Romans derived their name from the circumstance of their appearing to swim through the air. They live in pairs, and seldom have more than two young ones at a time, breeding in the wild state about twice in the year, and if the eggs be destroyed or removed they lay again; the male takes his turn with his mate in sitting during the time of incubation; and when the young ones are hatched, after about fourteen days' sitting, they are fed by both the parent birds, for the first few days with a substance resembling curdled milk, which afterwards becomes mixed with the half-digested food thrown up from the gizzard. In the domestic state they breed four, five, or six times, annually, and occasionally as many as nine times; in which case a single pair of Pigeons will, according to Stillingfleet, produce in the course of four years 14,762 young

ones, or by Linnæus's computation more than 18,000. They live upon pulse of different kinds, and go out into the fields to seek their food.

The species, which are numerous, are divided into three subgenera:—1. *Gallina* Pigeons; 2. *Common* Pigeons; and 3. *Columbars*; of which the genus *Vinago* has been formed.

The Illustrated Species (Plate 10) are the following:—

The *Carunculated Pigeon* (*C. Carunculata*), about the size of the Turtle Dove; bill red and tipped with black; forehead furnished with a red skin extending to the ears; under the throat a red wattle; the eye surrounded with a red skin; the plumage generally of a deep grey; tail short and slightly cuneiform; legs red, with crooked claws. Native of the interior of the Cape of Good Hope.

The *Great Crowned Pigeon* (*C. Coronata*), nearly as large as a Turkey; upper parts of the body deep ash colour, shaded with purplish chestnut; at the bend of the wing a horny excrescence; head, breast, and belly of a dull blue, the former marked through the eyes with a black stripe; irides red; beak black; head-feathers in length about five inches, with loose webs, forming a beautiful crest; tail deep ash colour, but paler at its tip; legs dusky, and occasionally spotted with red. Native of the Moluccas and New Guinea, and not unfrequent in Amboina, but they will not propagate in Europe.

Brisson and Buffon have placed this bird among the Pheasants.

The *Stock Dove* (*C. Enas*), is, according to Colonel Montague, the bird from which all our varieties of Domestic Pigeons spring; it is about fourteen inches long; the head, upper part of the back, wings, fore part of the neck, lower part of the back, rump, and upper tail-coverts, are dull ash colour; the back, and sides of the neck, green gold, glossed with copper; lower parts of the neck and breast vinaceous; legs red, and claws black. It inhabits many parts of England, living in hollow places in the rocks, among ruined houses, or holes of trees. Among the varieties of this species we find *Tumblers*, *Jacobines*, *Croppers*, *Pouters*, *Runts*, *Turbits*, *Owls*, *Nuns*, *Carriers*, *Dragoons*, cum multis aliis.

The *White-headed Pigeon* (*C. Leucocephalus*), figured on Plate 10, is another species of the *Common Pigeon*.

The *Carrier Pigeon* (*C. Tabellaria*) is also deserving of notice; it is of a dusky colour, and has a number of remarkable tubercles about the eyes and bill; the irides are scarlet, and the legs red. The Carrier Pigeon has long been employed for the purpose of speedily conveying letters from one place to another, as it is said to travel at the rate of twenty-six miles an hour. In an experiment made with one of these birds some years since, the flight from Salisbury to London was accomplished in three hours and seven minutes, a distance of eighty-three miles; so that the bird must have travelled at the rate of more than twenty-seven miles per hour. In 1819 a Carrier Pigeon flew from Norwich to London, 109 miles, in four hours and fifty-five minutes; the same bird had arrived in London a short time before from Bury, seventy-two miles, in three hours. This will give some notion of the speed at which these birds fly, and may perhaps induce us to listen with some attention to Lithgow's account of a Pigeon's flight from Babylon to Aleppo, a thirty days' journey, in forty-eight hours. The use of the Carrier Pigeon was well known to the ancients; and we find Anacreon describing it in his Ode, *Εἰς Ἡερίστειραν*, as his ready messenger to the boy Bathyllus. But it served a better purpose when Brutus, shut up in Mutina, contrived to correspond with Hirtius, who was without, at the time his couriers were intercepted by Antony.

Formerly the Pigeon was employed by the English Factory at Scanderon, to carry intelligence of the arrival of their ships in that port to Aleppo, a journey which it would perform in two hours and a half. Dr. Russel, in his *Natural History of Aleppo*, states, that the Pigeon had a young brood at Aleppo, and being sent down to Scanderon in an open cage, from which, as soon as she was set at liberty, she made her way with all speed to her nest. The natives stated that the Pigeons were brought down at once to Scanderon without any education; but Dr. Russel believed that they were rather taught to fly short distances at first on the Scanderon road. He also observed that the Pigeon, when let loose, instead of

making her way to the high mountains in the neighbourhood, towered almost perpendicularly at once, as if to get its sight free from all obstacles. Bochart, in his *Hieroicon*, gives a similar account.

Maillet, in his *Description de l'Egypte*, mentions the circumstance of a Pigeon despatched from Aleppo to Scanderoon, which mistook its way, and being absent three days, "had in that time made an excursion to the island of Ceylon; a circumstance then deduced from finding green cloves in the bird's stomach."

Formerly when the execution of criminals took place at Tyburn, it was customary to let Carrier Pigeons loose to inform their friends of the moment at which the culprit was turned off; and Hogarth has made use of this incident in the last picture but one of his *Industry and Idleness*, in which Thomas Idle finishes his career.

The *Draught Pigeon*, or *Dragon*, as it is usually called, a cross-breed between the Carrier and Horseman Pigeon, has the same inclination to return home; and has been known to come from Bury to London in two hours and a half.

VINAGO. But few of the African species of this genus are known; they are inhabitants of extensive woods; they subsist on fruit; and their plumage is generally vivid green, variegated with bright yellow.

The *Walia Pigeon* (*V. Abyssinia*) is eleven inches long; general colour of the plumage green; the belly of a bright yellow; bill bluish white; irides dark orange; toes red. It inhabits the lower parts of Abyssinia in large flocks, being found, according to Mr. Salt, among the Daro trees near a stream.

The *Bald-fronted Pigeon* (Plate 10) is another species of this genus.

ORDER V.—GRALLATORIA. WADERS.

THE individuals forming this Order are generally distinguished by part of the tibia being naked, and by the elongation of the tarsi. The external toe is commonly united to the middle one at the base by a short membrane, and in some of the genera the thumb is altogether wanting. They are also called Shore-birds as well as Waders.

Family—SHORT-WINGED; *Brevipennata*.

The wings of the *Brevipennata* are so short as to render them incapable of flight. The beak and regimen connect them with Gallinacea.

ILLUSTRATIVE EXAMPLES.

PLATE 11.

Genera.	Species.	Common Name.
Struthio - - - -	Camelus - - - -	Ostrich.
Rhea - - - -	Americana - - - -	Nandu.
Casuarus - - - -	Galeatus - - - -	Cassowary.
Dromaius - - - -	Ater - - - -	Emeu.

CHARACTERS OF THE GENERA.

1. **STRUTHIO** (Gr. *στρούθος*). Beak of moderate size, obtuse, depressed, and rounded at the tip; mandibles of equal length, weak and flexible; tongue short, thick, and slightly bifid at the tip; nostrils oblong and open near the middle of the beak; eyes large, their lids furnished with lashes; wings unfit for flight, armed with two spines or barbless shafts, and covered with long, soft, flexible feathers instead of quills; legs very long and stout, furnished with two toes in front, of which the outer is nailless, and half the length of the inner, which is large and furnished with a thick, oblong, hoof-like nail; upon the chest and belly are large callous patches, and upon the knees smaller ones of the same kind.

2. **RHEA**; 3. **CASUARIUS**; 4. **DROMAIUS**.

The characters distinguishing these genera from the Ostrich may be thus briefly enumerated: the Nandu (*Rhea*), which is most nearly allied to the Ostrich, is little more than half its size; the barbs of its feathers are less full; it has only one very short spur to the wing, but it has three toes all furnished with thick nails: the Cassowary (*Casuarus*), also much smaller, has a remarkable bony casque or protuberance upon the front of the skull, has wattles upon the neck, has five barbless shafts to each wing, which are

so small as scarcely to be noticed, has not any tail-quills, has the barbs of all the feathers so short as to give the appearance of the whole body being covered with coarse hair, and has three toes to each foot: the Emeu (*Dromaius*) almost equals the Ostrich in size; its plumage nearly resembles that of the Cassowary, and like it the feet are three-toed, but the wings are mere rudiments, scarcely six inches in length, have not any spur, and are covered with the hair-like plumage of the body. Each of these genera have their peculiar station; for whilst the Ostrich is spread over Arabia and the greater part of Africa, the Nandu is found only in South America, the Cassowary in India, and the Emeu in Australia; thus, as it were, giving a representative of this remarkable family to each of these large districts of the earth.

BREVI PENNATA.—DESCRIPTION OF THE SPECIES.

STRUTHIO (*Camelus*)—*Ostrich*—is generally from seven to eight feet in height; beak horn-coloured, blackening towards its tip; openings of the ears hairy; the head, excepting its top, which is bare, and neck, which is slender, is covered sparingly with whitish coarse down, so that the colour of the skin is visible through it: in the male the lower part of the neck and the whole body are covered with the deepest black intermingled with whitish feathers, but in the female they are all brownish-grey; in both sexes these feathers are loose, which give the bird an elegant appearance; and instead of wing-feathers, they have long, loose, undulating, snowy-white plumes, several of them with black edges or tips, and similar plumes occupy the place of the caudal quills; the lower limbs are featherless, and covered only with down. The strong legs are covered with tough reticulated skin-like scales; the inner toe is very large, tipped with a strong hoof-like nail, and connected by a stout membrane to the outer. The Ostrich is more especially a native of the sandy deserts of Arabia and Africa, and is very common near the Cape of Good Hope. It pastures in large groups upon open plains, and very commonly with Quaggas; it feeds upon grass, seeds, fruit, and occasionally also upon eggs and worms; it also greedily swallows stones and pieces of metal, which are necessary for the breaking up of its food in the gizzard, and without which it could not be properly nourished. Cuvier mentions that the weight of stones, iron, and copper, which he found in the stomach of an Ostrich that died in the Garden of Plants, at Paris, amounted to a pound, which, however, is no great matter in comparison to the bulk of an animal, whose weight exceeds three hundred pounds. They move in a stately manner and are soon out of sight, although their pace seems little more than walking, but when put to speed they would easily outstrip the swiftest horses, saving their disposition to run in circles of greater or less extent. When running they spread their wings, not however for the purpose of flight, but as balances to prevent their toppling on one side. Their disposition is very mild, and they rarely act on the offensive, soon become tame after capture, and allow themselves to be rode without danger.

The nest of the Ostrich is, according to Burchall's account, a bare cavity scratched in the sand, six feet in diameter, surrounded by a trench equally shallow, and without the smallest trace of any materials, such as grass, leaves, or sticks, to give it a resemblance to the nests of other birds. Within the hollow are laid from twenty to thirty eggs (Le Vaillant, however, says, generally ten), and in the surrounding trench some others intended as the first food for the young which are hatched from the eggs in the central hollow. This curious provision was first noticed by Le Vaillant, and after him by De Bougainville. When first mentioned it was doubted, but other travellers have since confirmed the assertion.

The eggs are large and heavy, containing, according to Burchall, about twenty-four times as much as our common hen's eggs, and weighing about three pounds; the shells are very hard, and of a dingy white tinged with yellow. The time of year at which the Ostrich lays, and the length of time she sits, are alike unknown; but the well-known fact that in the same district, and at the same time, there are Ostriches laying eggs, young ones of two or three months old, and some as large as the parent bird, is no proof against there being a regular breeding-time, and can easily be explained by the animal laying again and again if her eggs be abstracted as

already mentioned, and consequently the hatch is deferred beyond the usual period. The Hottentot method of cooking these eggs consists in making a hole at one end, into which a forked stick is introduced, and twisted about till the yolk and white are perfectly mixed; the shell is then placed on the fire and constantly turned till the inside has acquired the consistence of a boiled egg.

The flesh of the ostrich is used as food by the African tribes: it is dark-coloured, coarse, tough, and resembling beef; but the stomach is considered the choice part, being most tender and delicate.

The feathers, so highly prized as ornaments of dress, are from the wings, and not from the tail as generally supposed.

RHEA (Americana)—Nandu. Measures about four feet nine inches in height; upper and back part of the head blackish, and from the nape a black stripe passes down the neck to its junction with the trunk, where it expands and forms a collar surrounding its whole circumference; the other parts of the head and neck white; general colour of the plumage of the body white, except on the back, where it is leaden; shoulders and scapulars ashy, as are also the alar quills, except the primaries, which are white at their roots and blackish in the middle; legs flesh-coloured. It is found only in South America. The female begins to lay towards the end of August, and the young begin to be hatched about the early part of November; at this time the mother's call resembles that of the human whistle. When undisturbed, their walk is slow and majestic, carrying the head and neck upright and the back rounded; but in making their escape from their enemies, their speed is so great that they outstrip the fleetest dogs and horses, and when surprised are caught only with the lasso. Much caution, however, is required in approaching them, even when hampered in the cord, as they kick so violently as to break even stones. The Indians use their larger feathers for making parasols, bags, and other ornaments.

CASUARIUS. The *Cassowary* (*C. Galeatus*) is not quite so tall as the Ostrich but nearly as large; it has upon the forehead a bony projection covered with a thin plate of horn about an inch broad at the base and three inches in height, resembling the casque of a helmet; the beak is compressed laterally, and the tips of the mandibles are slightly sloped; the head is covered with a bluish skin, having a few scattered black hairs which form a circle round the external opening of the ear, which is very large; this blue skin, which extends to the middle of the neck, is studded with pits and caruncles; and on either side of the throat a wattle depends, which is broadest below and of a reddish colour; the eye is small, and the upper lid studded with hairs like an eyebrow, which gives the bird a threatening aspect; the iris topaz-coloured; the lower part of the neck is covered with short feathers, which become longer as they pass along the back to the rump; the thighs are also feathered to the tarsus. The general colour of both male and female is black; the eggs are greyish-white thickly spotted with green, and are carefully covered up in the sand by the parent. This bird is a native of the south-eastern parts of Asia, the Moluccas, Sumatra, Java, &c., but they are rare; it has been introduced into Amboina, but is not indigenous. Valentyn compares the voice of a Cassowary to that of a young chicken. Though a very heavy bird, and considered by the natives as stupid, it runs more quickly than the Ostrich, running a few steps and then bounding forward on both feet; it is very difficult to catch, and when attacked it strikes violently with its beak and feet.

DROMARIUS (Ater)—New Holland Cassowary, the Emu of the settlers. Beak depressed; a circle of naked skin surrounds the ear; the head and neck are covered scantily with feathers, particularly the throat, so that the purple hue of the skin is easily seen; it has no prominence on the head, nor has it spines or caruncles on the wings, which are shorter than those of the Cassowary; the plumage is of a dusky brown merging to black; the legs, which are of the same colour, are crenated behind, and the nails of the toes are equal in size. It is very quick, surpassing in speed the best Greyhound. It utters a deep clucking noise like a heavy stroke on a muffled drum. The eggs are of a bright green, and about the same size as those of the Cassowary. Is a native of New Holland; its flesh is said to taste like beef.

Family—FLAT-BEAKED; *Pressirostrata*.

This family includes a number of genera having elongated tarsi, in which the hind toe is either wanting or so short as not to reach the ground. The bill is sufficiently strong to bore into the earth in search of worms.

ILLUSTRATIVE EXAMPLES.

PLATE 12.

Genera.	Species.	Common Name.
Otis - - - - -	Tarda - - - - -	Great Bustard.
Edicnemus - - - - -	Crepitana - - - - -	Common Thick-knee.
Charadrius - - - - -	Pluvialis - - - - -	Golden Plover.
Vanellus - - - - -	Melanogaster - - - - -	Grey Sand-piper.
Hæmatopus - - - - -	Ostralegus - - - - -	Pied Oyster-catcher.
Cursorius - - - - -	Chalcopterus - - - - -	Bronze-winged Courser.
Dicholophus - - - - -	Cristata - - - - -	Margrave's Cariama.

CHARACTERS OF THE GENERA.

1. **OTIS.** Beak not as long as the head, straight, conical, compressed or slightly depressed at the base; point of the upper mandibles slightly arched; nostrils close to each other, oval and patulous, and far from the base; wings of moderate length, the third quill-feather the longest, the second not so long, and the first the shortest of the three; legs long, naked above the knee; feet three-toed, the toes short, united at their roots, and edged with membrane; claws flattened.

2. **EDICNEMUS** (Gr. *ᾠδεω*, *I swell*, and *κνήμη*, *a knee*). Beak longer than the head, straight, strong, slightly depressed at the base, and compressed towards the tip; ridge of upper mandible elevated, lower mandible angular; nostrils in the middle of the beak, longitudinal, and perforated through and through; wings of moderate length, the first quill-feather rather shorter than the second, which is longest of all; tail graduated; legs long and slender; three toes in front, connected to the second joint by membrane which is continued along the edges of the toes.

3. **CHARADRIUS** (Gr. *χαράσσω*, *I excavate*). Beak short, slender, straight, and compressed, its tip obtuse; nostrils linear, feet formed for running, three-toed, the outer toes connected at their base by membranes; tail rounded or wedge-shaped; wings in some species armed with a spur.

4. **VANELLUS.** Beak short, slender, straight, compressed, and the tip of both mandibles swelling, the base of the upper one very wide from the lengthening of the nasal grooves; nostrils lateral, pierced in the membrane of the grooves; wings pointed or large; in some species the bend of the wing armed with a long sharp spur; legs slender, having three toes in front and one behind, almost rudimental, and not touching the ground, the middle and outer toes connected by a very short membrane.

5. **HÆMATOPUS** (Gr. *αἱμόεις*, *bloody*, and *πούς*, *a foot*). Beak long, slender, strong, straight, and compressed, tip square like a pair of scissors; nostrils linear, placed near the base of the groove in the upper mandible; wings of moderate length, the first quill-feather the longest; legs strong and muscular, having the tarsi reticulated, and three toes in front, of which the outer is connected by membrane to the middle as far as the first joint, and the inner to the middle by a short membrane; all the toes edged with a narrow membrane, and the nails short and slightly curved.

6. **CURSURIUS.** Bill, slender, conical, about the length of the head; mandibles arched, compressed at tips, which is sharp; wings short; legs long; three toes, without any thumb or palmature, middle toe the longest,

7. **DICHOLOPHUS.** Beak long, curved; legs long, scutellated; toes three, short, and palmated; thumb short.

DESCRIPTION OF THE SPECIES.

OTIS—Bustard. The Bustards seem to form the connecting link between the Gallinaceous and Wading birds, by the firm carriage and the connection of the toes, together with their membranous edging of the former with the long bare legs of the latter. They are shy, heavy birds, rarely flying, except when they cannot escape pursuit by running, in which they are very swift, and then they fly long and rapidly. They prefer sandy and rocky districts far from water, and feed on herbs, grain, insects, and worms. There is but

one male to several females, and the latter become solitary when they begin to lay; they make their nests in hollow places among the corn, and the young shift for themselves as soon as hatched. They moult twice a year, and the colours of the male are more varied than those of the female.

There are eight species, which Temminck has divided into two sections: those which have the beak compressed, and those which have it depressed at the base.

The *Great Bustard* (*O. Tarda*) is about three feet three inches in length, but of less size according to the locality. On each side of the lower mandible a tuft of long, delicate, thread-like feathers; the head, neck, chest, and edge of the wings ash, with a longitudinal band along the middle of the head; back yellowish-rust streaked with black; under parts white; greater quill-feathers black; tail consisting of twenty feathers white, tinged with reddish for three-fourths of its length, and striped across with two black bands; beak bluish. The female is distinguished by not having the tufts of feathers on the lower mandible, by the stripe on the head not being so distinct, and by the ashy colour of the head being deeper. The young are buff-coloured varied with black above. The Bustard feeds on green corn, clover, and turnip-tops; it makes its nest in rye or other corn, and lays two eggs of an olive-brown colour, blotched with rusty and grey spots. It is found in some parts of France, in Italy, and Germany, but less commonly in northern than in southern countries. It is rare in England, was formerly found on Salisbury Plain, but is now very uncommon, though it still exists in Norfolk. How the bird has acquired the cognomen *Tarda* seems difficult to understand, as it runs extremely fast, and when put up flies many miles and not very slowly. The males are very remarkable for being provided with a large pouch which is capable of holding near seven quarts of water; it opens beneath the tongue and descends along the neck: it is supposed that this apparatus is provided to enable the bird to carry water to the female whilst sitting; and Bewick states that it serves him also as a defence against the predaceous birds by which he is occasionally attacked.

ŒDICNEMUS—*Thick-knee*. The *Common Thick-knee* (*Œ. Crepitans*). All the upper parts ferruginous-ash, with a longitudinal streak on the middle of each feather; belly and thighs pure white; neck and chest tinged with ferruginous and sprinkled with longitudinal brown streaks; under tail-coverts ferruginous, caudal quills, excepting the middle, tipped with black; base of the beak light yellowish, other part black; ocular circle and legs yellow. Is very common in the south of Europe, rare in Holland, not unfrequent in England, and a bird of passage in Germany; lays two eggs of a yellowish-brown colour tinged with green and marked with olive and black spots.

CHARADRIUS—*Plover*. The birds of which this genus is composed derive their name from the circumstance of their generally depositing their eggs in excavations in the ground. They live on open heaths, by the sides of hills, and the neighbourhood of the sea-coast; and their food consists of worms and aquatic insects. This genus is considered by Bewick to form the link between the land and water birds. About twelve species.

The *Golden Plover* (*C. Pluvialis*) is the size of a Turtle-dove; general colour—above, dark brown, or black spotted with yellow, as is also the neck, but paler; belly whitish; tail marked with dusky and yellow bars; beak and legs black. Common in this country, in the north of Europe, and America. They fly in small flocks, making a whistling noise, by imitation of which they may be enticed within gun-shot.

VANELLUS—*Lapwing*. This genus is distinguished from the *Charadrii*, with which they are allied, by the similarity of their beak, by the existence of a very small hind toe, which never reaches the ground, and is sometimes scarcely discernible; its presence, however, led Linnæus to include these birds in his genus *Tringa*, and it connects the genus with the other four-toed Waders. They are migratory, leaving in cold weather and returning sometimes as early as February, travelling in large flocks by the union of many coveys. They inhabit marshy districts, both in the neighbourhood of the sea and fresh waters, feeding on worms, insects and their larvæ, and slugs. Those which are found in this country moult twice a year, and there is not any distinction in the plumage of the sexes; but whether the foreign species are subject to a double moult is unknown. Cuvier divides the genus, which

includes about ten species, into two, by the names *Squatarola* (Bastard Lapwing) and *Vanellus* (True Lapwing).

The *Grey Sandpiper* (*V. Melanogaster*), figured on Plate 13, is ten inches and a half in length; beak black; irides blackish: its plumage undergoes several changes according to the seasons and its age; but throughout these several changes, it greatly resembles the Golden Plover, *Charadrius pluvialis*: it is, however, distinguished by the presence of the hind toe, and by the long black feathers on the insides of the wings close to the body. This species is found in the northern hemisphere, in Europe, Asia, and America. It is met with in Egypt, and is also found in the Isles of Sonda and in New Guinea. In this country it makes its appearance, in its northward journey, on the Norfolk coast during May, and returns southward in September.

The *Crested Lapwing* (*V. Cristatus*) is a species very common throughout the old world. They are very numerous in the warrens of Norfolk, and in the fenny districts of Cambridge and Lincolnshire. They make their appearance in England in February or early in March, soon spread over the country, and remain with us till November. After pairing on their arrival, they perform very curious evolutions in the air, darting upwards perpendicularly to a considerable height, then throwing a summerset, they drop nearly to the ground, and, after wheeling about rapidly several times, they again tower. By the rapid movement of the wings in these exercises a loud hissing noise is produced, and this is accompanied with a long uninterrupted cry, very different from that of alarm, which has attached to them in this country the name of *Pee-wit*, and in Germany the corresponding *Kiebitz*.

HÆMATOPUS—*Oyster-catcher*. The Oyster-catchers are always found on the sea-shore, following the tide in search of marine animals, which they drag along the shore, and, if bivalves, open by means of their narrow, wedge-shaped beak, which is admirably adapted for that purpose; and they also dig in the sand for worms. They both run and fly quickly, and have a long, shrill cry. Although assembling in large groups for their migration, they live solitarily during the breeding season, and build in the marshes near the sea.

There is but one English species, the *Sea Pie*, or *Pied Oyster-catcher* (*H. Ostralegus*), which is about fifteen inches long, and two feet wide; the bill is a bright orange, as are also the naked ocular circle; the head, neck, upper part of the chest, back, wings, and tip of the tail deep black; the under eyelids white, as also a crescent-shaped collar under the throat, which latter is black in pairing-time in the spring; all the under parts are beautifully white; irides crimson; legs pale red like blood, whence the generic name. They lay their eggs in open, dry situations, only sheltered by a few blades of grass, which are left during the day to the heat of the sun, but at night are carefully sat on by the hen. The young are easily tamed, and will live among poultry. Although not good swimmers, they are not averse to the water, on which they float rather than swim. Native of the British coasts, and of the northern parts of Europe and America.

CURSURIUS—The *Bronze-winged Courser* (Plate 12) is a fair representative of this African genus. These birds approximate the Bustard both in habits and appearance; they inhabit the arid inland tracts of Northern Africa, where they run with great swiftness.

DICHOLOPHUS. A South American bird; wild, and of very retired habits, preferring the vast uninhabited plains to the neighbourhood of human habitations. Hunters catch them with great difficulty, for the bird as soon as it spies the approach of its enemy, which it can at a vast distance, it immediately sets off with great rapidity.

The *Dicholophus* is related to the poultry, as is seen by the fact, that notwithstanding its shyness in its wild state, it is easily tamed, and will live sociably with its fellow-occupants of the poultry-yard.

Marcgrave's Cariama (*D. Cristata*), Plate 12, is larger than the Heron; its plumage is yellow, with wavy streaks of brown; a few disunited feathers form a light crest, which overhangs the base of the bill; space round the eyes destitute of feathers, the skin being of a bluish colour; the naked parts of the leg, feet, and toes are orange. Its food, in its wild state, consists of Lizards and insects; and its voice is loud, like that of a young Turkey. The flesh of the *Dicholophus* is much esteemed.

Family—KNIFE-BEAKED; *Cultirostrata*.

The beaks of this family are long, stout, and thick, and most generally pointed and trenchant. The family is composed of the Cranes, Herons, and Storks.

ILLUSTRATIVE EXAMPLES.

PLATE 13.

Genera.	Species.	Common Name.
Cancroma - - - -	Cochlearia - - -	Boat-bill.
	Major - - - - -	Common Heron.
Ardea - - - - -	Egretta - - - - -	Great Egret.
	Stellaris - - - - -	Bittern.

PLATE 14.

Ciconia - - - - -	Alba - - - - -	White Stork.
Mycteria - - - - -	Senegalensis - - -	Senegal Jabiru.
Scopus - - - - -	Umbretta - - - - -	Tufted Umbre.
Anastomus - - - -	Lamelligerus - - -	Coromandel Erod.
Tantalus - - - - -	Lacteus - - - - -	Milky Tantalus.
Platalea - - - - -	Aiaia - - - - -	Roseate Spoonbill.

Other Genera of this Family:—Grus, Psophia.

CHARACTERS OF THE GENERA.

1. **CANCROMA** (Lat. *Cancer*, a Crab). Beak long, broad, and ovate; the upper mandible resembling in shape two spoons joined by their edges, and having a pointed tooth on each side of its tip; the under mandible straight, smooth, its tip abruptly acute.

2. **ARDEA**. Beak longer than the head, strong, and with its base broader than high; the upper mandible nearly straight, and having a little nasal pit continued into a groove extending almost to its tip; eyes placed in naked skin reaching to the beak; neck, slender, long, and furnished at the base with elongated feathers; legs slender, having four long toes connected as far as the first joint by membrane; the claw of the middle one remarkable for having its inner edges serrated.

3. **CICONIA**. Said to be so called from the Cicones, a people of Thrace, in which country the bird was abundant. Beak large, strong, straight, long, conical, sharp-pointed, and not grooved; nostrils close to its base; tongue very short; mandibles thin and broad; legs reticulated; feet tetradactyle, the three front toes connected to each other by membranes at their base, especially the external toes; the hind toe rests on the ground.

4. **MYCTERIA** (Gr. *μυκτήρ*, a nose). Beak long, conical, compressed, slightly curved upwards, smooth, strong, and pointed; mandibles straight, the upper trigonal, the lower much thicker and inclined upwards; gape of moderate size; nostrils longitudinal and narrow; head and neck more or less bare; tarsi reticulate; front toes connected by membrane.

5. **SCOPUS** (Gr. *σκιὰ*, a shadow). Beak compressed, blunt; upper mandible surmounted with a distinct ridge; nostrils in a groove, linear, long, and partially closed with membrane; legs of moderate length, four-toed, the middle one shorter than the tarsus, the hind toe reaching the ground, the toes webbed to the first joint.

6. **ANASTOMUS** (Gr. *ἀναστόμω*, I open the mouth). Beak longer than the head, thick, compressed; mandibles only touching at the base and tip; upper mandible nearly straight; lower mandible convex downwards in the middle; nostrils near the base, lineal, lateral; legs long and slender, in part naked; the three front toes united by a short membrane, the hind toe half the length of the others, articulated on the inside and above them.

7. **TANTALUS**. Beak very long, straight to within three inches of its tip, whence it gradually bends downwards; tip compressed, cylindrical, and notched or toothed; edges of both mandibles sharp; nostrils high on the forehead, covered by an extension of the horny bill, but not opening into any pit; top of the head covered from the root of the beak with a hard, horny, smooth hood, which is truncated opposite the ridge of the beak and above the eyes; from the corners of the mouth there is a naked, smooth, broad band of skin; chin, throat, and upper half of the neck devoid of feathers, but covered with scales of cuticle; wings rather long; caudal quills short, and concealed by the long coverts; legs very long; tarsus

twice the length of the middle toe; the lateral toes connected by broad truncated membranes.

8. **PLATALEA** (Gr. *πλατὺς*, broad). Beak very long, much flattened, and expanded towards the tip in form of a spoon; upper mandible fluted, and transversely grooved at its base; nostrils approximate, oblong, oval, edged with membrane; head and face partially or entirely bare; wings of moderate length, but wide; legs strong and powerful; three toes in front, connected as far as the second joint by membrane; hind toe long, and resting on the ground.

9. **GRUS** (Gr. *γέρανος*, a Crane). Beak compressed, thickish, straight, as long or longer than the head, elongated at the point into a cone flattened at the extremity; lateral edges of the upper mandible deeply grooved, ridge sharp; nostrils in the middle of the bill pierced from side to side through the grooves, concave, elliptical, closed posteriorly by membrane; ophthalmic region and lore feathered; legs long and strong, unfeathered to some distance above the knees, and scutellated; hind toe short, hardly reaching the ground; of the front toes, the middle and outer connected by a short membrane, the inner free; nails short and flattish; cæcum single.

10. **PSOPHIA** (Gr. *ψοφέω*, I make a hollow noise). Beak short, vaulted, conical, curved, very much hooked at the point, longer than the lower mandible, compressed, and the ridge distinct at the base; nasal pits wide and expanded, the nostrils near the middle of the beak, open in front, and closed behind by a naked membrane; wings short and concave; legs long and slender; middle and outer toe connected, inner toe distinct; hind toe articulated internally on a level with the other toes.

CULTIROSTRATA.—DESCRIPTION OF THE SPECIES.

CANCROMA—*The Boat-bill* (C. *Cochlearia*) very much resembles the Herons in its general structure and habits, but it is very remarkable for the formation of its bill (Plate 13). Brisson considered it to resemble two spoons joined at their edges, and he therefore called the genus *Cochlearius*. Brown and others, however, thought that it had more the appearance of a boat with the keel turned upwards, and therefore named it *Boat-bill*. Linnæus gave it the name *Cancroma*, from the bird living on Crabs. On either side of the ridge which runs along the top of the upper mandible, is a long groove, at the root of which are placed the nostrils. The bird is about the size of a fowl; the beak is of a dusky colour, the forehead whitish, and from the upper and back part of the head extends a long black crest, which becomes narrow at the point, the longest feathers being six inches in length; the upper part of the neck bluish-white, the abdomen reddish, and the back brown or grey; the legs and thighs together are about seven inches in length, and the bare part on the front of the thighs and the legs are yellow; the toes are four to each foot, long, and slightly webbed. This genus inhabits the hot and marshy parts of South America, living on the banks of rivers, where it sits upon the trees and pounces down upon the fish, which form its principal support.

ARDEA—*Heron*. This genus frequents the banks of lakes and rivers, living principally on fish, of which they destroy great numbers; they build in the same places in large societies, and migrate in flocks periodically; when flying the neck is folded on the back, and the legs extended; the sexes do not differ, but the young are very various, so as to render it difficult to class them.

The species are so numerous that they have been arranged into four subgenera; but the distinctive features are so ill defined, and the points of difference so unimportant, as not to deserve particular attention. The species illustrated are three (Plate 13).

The *Common Heron* (A. Major). More than three feet high; the forehead, neck, middle of the belly, edge of the wings and thighs white; the fore part of the neck studded with black and grey spots; a deep black tuft on the occiput; the beak and insides of a deep yellow; the legs brown, and the naked space above the knee red. Their appetite is enormous, and Willughby states that they will eat fifty small roach and dace in a day. They usually obtain their prey by wading into the water, but oftentimes dash at it whilst on the wing. Common in this country.

Heron-hawking was formerly a celebrated sport, and a penalty of twenty shillings was imposed on any person taking the eggs.

The *Great Egret* (*A. Egretta*) is entirely white, but much larger than the preceding. Many of the feathers on the back are a foot and a half long, extending beyond the tail; the beak and irides are of a bright yellow; the legs green. It is common in Asia, some parts of Africa, and the south of Europe: it is also found in America, which Stephens thinks may be another species; but Cuvier considers it as belonging to this.

The *Bittern* (*A. Stellarus*) is about two feet six inches long; the general colour of the plumage is a dull yellow, variegated with spots, or bars of black; the crown of the head black; the tail short; irides yellow; legs green. It lives, in the rushes of large marshes, a solitary life, continuing whole days in the same spot, where they sit with the head erect, so that they can see without being seen. They are very fierce, and when wounded will lie on their back and fight furiously with their beak and claws. Mr. Markwick, in relating a circumstance of this kind, states that the Bittern he had shot repulsed the dogs, nor could it be taken till it was fired at again and killed. The eggs which are laid in April are hatched in about three weeks; and whilst the young are bringing up, which is about two months, the male makes a curious noise like the bellowing of a bull, whence Brisson has named it *Botaurus*, from *bos* and *taurus*. It also makes another singular noise during the autumn evenings after sunset, well known as the Bittern's drum.

CICONIA—Stork. This genus differs from the Herons in not having the beak grooved, and in having the toes more webbed, and not serrated; and from the Cranes in having the nostrils close to the base of the beak, instead of being distant from it, and in having the hind toe bear upon the ground, instead of being some distance from it.

The *Ciconiæ* form a very interesting genus, on account of the readiness with which they may be domesticated, their mild temper, and the service they render in destroying the reptiles which in hot countries are so numerous as to be a great inconvenience. They march unconcernedly about the fields, and in the streets, picking up any offal with which they may chance to meet, and on that account they are protected in Holland and Turkey. They have no peculiar cry, except at the time of migration, but they make a clacking noise by shutting the mandibles, which are broad and thin, smartly and frequently. When the bird is irritated or alarmed, it throws the head back in such a way as to make the beak parallel to the back, and strikes the mandibles sharply against each other. They are migratory, not staying in Europe later than August.

There are four species—the *White Stork*, common in Holland; the *Black Stork*, numerous in Hungary, Turkey, and Poland; the *American Stork*, native of the Brazils; and the *Gigantic Crane*, the *Argala* of Bengal. This last-named species is about five feet in height and seven in length, notwithstanding which, and its immense beak, it is so great a coward, that a child with a whip will put it to flight.

The *White Stork* (*C. Alba*) is larger than the Common Heron, being rather more than three feet and a half in length from the tip of the beak to that of the tail; general plumage white, with black wing-feathers; beak and legs red; the eyes surrounded with a fold of naked skin of a reddish-black colour: the females resemble the males, but the young are distinguished by the brownish tinge of their wings and the dusky redness of their bills. These birds are fond of the haunts of men, and may be said to be almost domestic, as in Holland they are frequently seen building on the roofs of houses, where the inhabitants often place boxes for them in which they make their nests. They are good tempered and easily tamed; and although inclined to a grave air and mournful appearance, will, when amused by the fondness of children, play about and seem to join in their sports, an instance of which, related by Dr. Hermann, is worthy of notice. "In a garden," says he, "where the children were playing at hide and seek, I saw a tame Stork join the party; run its turn when touched; and distinguish the child whose turn it was to pursue the rest so well, as along with the others, to be on its guard." They build their nests in belfries, tops of trees, or other inaccessible places, so that their offspring may be

concealed; and it is observed that they will return year after year to their old haunts, as if thankful for the shelter afforded to them. They lay two or four eggs at a time, which are rather larger than Goose's eggs, and of a yellowish-white colour: the male supplies the place of the female occasionally, during the time of incubation, when she leaves the nest to go in search of food. After a month's sitting the young are hatched, and are then covered with a brownish-coloured down: but the care of the parent birds does not stop here, for one of them continues to watch over the young whilst the other is out in quest of food, till they are able to leave their nest. As a proof of their affection for their young, a celebrated story is current in Holland, that when the city of Delft was on fire, a female Stork in vain attempted several times to carry off her young ones; and finding she was unable to effect their escape, suffered herself to be burnt with them.

MYCTERIA—Jabiru. This genus differs so little from the Cranes that Temminck and Illiger include them in the genus *Grus*. In their habits they closely resemble the Cranes. There are three species, one of which, the *Senegal Jabiru* (*M. Senegalensis*), is figured on Plate 14. This bird is somewhat larger than a Swan; the beak is red at the tip, and otherwise white throughout, except a black spot at the base and a white stripe on each side; the plumage white, except the scapulars, which are black, as are also the neck and legs. It inhabits the western coast of Africa.

SCOPUS—Umbre. This genus, to which, from its umber colour, the name *Scopus* has been applied, and rather oddly derived by Brisson from *σκῆα*, a shadow, very nearly resembles the *Ciconia*, from which it is distinguished by the cutting ridge on the upper mandible, and by its lateral grooves, in which the nostrils are placed. There is but a single species, the *Tufted Umbre* (*S. Umbretta*), length twenty inches, of which the beak is three and a half. The whole plumage is of a brown colour, similar to the earth called umber, paler on the under parts, and palest on the shafts of the neck feathers; tail marked with three or four bars of a deeper hue, and tipped with the same; bill brown; legs dusky. It is a native of the Cape of Good Hope and Senegal.

ANASTOMUS—(called HIANS by Lacep., from *hiare*, to gape). This genus was separated from the Herons by Illiger, on account of the open space between the middle of the mandibles, and named by him in consequence *Anastomus*. These birds nearly resemble the Storks in their mode of living; they are found on the banks of rivers and marshes, into which they enter, but never attempt to swim.

Two species are found—the *Indian Anastome* (*H. Typus*), which is the same as the *Ardea Coromandeliana* of Latham and Sonnerat. The other is the *African Anastome* (*H. Lamelligerus*), which is remarkable for the elongation of the shafts of the feathers of the neck, belly, and thighs, by a shining black broad cartilaginous plate at the tip of each, which resembles the feathers of *G. Sonneratii* (Plate 11).

TANTALUS—Scythe-bill. This genus, according to the arrangement of Linnæus and of Latham, included the genus *Ibis*, which has been separated by Cuvier on account of the much weaker beak of the latter having no notch in the upper mandible, and the nostrils opening into grooves, which extend from its base nearly to its tip. The Scythe-bills are rarely found except upon the swampy banks of rivers or ponds of fresh water, commonly in the openings of woods. In their manners and gait they resemble the Stork, and when gorged with food are as inactive as the Heron.

There are four species—the *American Scythe-bill* (*T. Loculator*), about three feet and two inches in length, or about the size of the Common Stork; the *White-headed Scythe-bill* (*T. Leucocephalus*), about three feet and a half in length; a native of the continent of India, and also of Ceylon; the *African Scythe-bill* (*T. Ibis*), about forty inches in length; and the *Milky Scythe-bill* (*T. Lacteus*), figured on Plate 14. This species is only three feet in length, and principally distinguished from the former by its orange-yellow beak being shorter and weaker; by its nostrils being ovoid instead of roundish; by the summit of the head and the ocular regions only being bare, and by the throat being less naked; the bare part of the head is red, marbled more or less with black, the other naked parts are red only; the

whole plumage pure, unclouded white, except the alar and caudal quills, which are greenish-black or bronze; legs red. It is found in the marshes and on the river banks in the island of Java.

PLATALEA—Spoonbill. These birds live in flocks among wooded marshes, near the mouths of rivers; and rarely on the sea-shore, where they feed on very small fish, spawn, and fresh-water shells, as well as small reptiles and water-insects. They build sometimes in lofty trees, and sometimes in bushes or among reeds.

The *Roseate Spoonbill* (*P. Ajaja*) is about two and a half feet in length; the beak is covered with hard scaly protuberances like the edges of oyster-shells, which are whitish tinged with red, whilst the rest of the bill is black; top of the head and chin unfeathered, and covered with a greenish skin, and the latter capable of dilatation, as in the Pelicans; cheeks and occiput covered with bare black skin; ocular circlelets orange; neck covered with short white feathers, tipped with crimson; chest white; from the upper part of the chest springs a long tuft of hair-like feathers of a pale rose-colour; back white; shoulders of the wings covered with long, hairy, carmine-coloured feathers, as are also the upper and under tail-coverts; belly rosy; tail-quills bright orange with reddish shafts; naked part of the thighs and legs dark dirty red; toes very long, especially the hind one. Is very common in South America, but chiefly found on the sea-shore and at the mouths of rivers.

The *White Spoonbill* (*P. Leucorodia*)—a native of Europe, common in Holland, and occasionally met with in England; and the *Slender-beaked Spoonbill* (*P. Tenuirostris*), native of the Isle de Luçon, are the other species.

GRUS—Crane. The individuals composing this genus were included by Linnaeus among his *Ardeæ*; in which, however, the gape is deeply cleft, extending as far as the eyes, the hind toe resting almost entirely on the ground, and the claws strongly hooked; in all which points the Cranes decidedly differ. The flattened form of the nails of the Cranes also indicates that they are not predaceous, which a knowledge of their habits proves to be the fact, the principal part of their food consisting of vegetable substances, although occasionally they feed on insects, worms, and reptiles.

Cranes are found in all parts of the world, but are migratory, preferring the southern climates during winter, and the northern whilst the summer lasts. In their progresses, they assemble in large groups; and, forming themselves into circular, triangular, or wedge-like figures, rise to so great a height in the air as to be hardly visible, but their flight is discovered by the loud noise they make. Cuvier has divided them into two kinds, from the length of the beak: 1. *Cranes with the beak longer than the head*; and 2. *Cranes with the beak not longer than the head*. There are nine or ten species.

PSOPHIA—Trumpeter. This genus appears, from its terrestrial habits and from the shortness and curve of its beak, to be connected with the Gallinaceous order, whilst the length of its legs and the position of its hind toe connect it with the more perfect of the Waders. One of the species, the *Gold-breasted Trumpeter* (*P. Crepitans*), a native of South America, is very fond of the society of man, and is among birds what the Dog is among beasts; it answers to the call of its master, runs along with him, is troubled in missing him, and when it has found him again shows most evident marks of pleasure; nay, so jealous is it, that when any one approaches too near its owner, it strikes at his legs. It is fond of having its head and neck rubbed, and teases till this is renewed. It is very courageous, attacking animals much larger than itself, and never quits till it puts them to flight. It is also said to be employed in many parts of America in taking care of the poultry-yard, and even in guarding Sheep, which it collects and brings home in the evening. Its common cry resembles the shrill voice of the Turkey; but besides this it produces internally a peculiar deep and hollow noise, resembling the syllables *tou, tou, tou, tou, tou, tou*, which is not uttered either from the mouth or vent, although the latter was supposed to be the organ for that purpose, and hence its trivial name *Crepitans*, or *Poule peteuse*, as it is called by the French. It is said to resemble in some respects ventriloquism, and it seems, as it were, to be conducted externally through the membranes and flesh.

Family—LONG-BEAKED; *Longirostres*.

The members of this family have a long, slender, and feeble bill, by which they dig or rather bore into the mud for their peculiar food—worms and small insects. The distinction between them and the *Pressirostrata* is very slight and vague.

CHARACTERS OF THE GENERA.

1. **HIMANTOPUS** (Gr. *ἰμάς*, a rein, and *πούς*, a foot). Beak long, slender, roundish, and pointed, the mandibles grooved from the base to their middle; nostrils lateral, linear, and placed in the grooves; legs long and slender; feet three-toed, the middle connected to the outer toe by a broad, and to the inner by a narrow membrane; nails short and slightly curved; the first quill-feather the longest.

2. **IBIS.** Beak arched, long, slender, thick at the base, and quadrangular, rounded at the tip, which is obtuse; nostrils linear, extending from the root to the tip of the beak, and dividing it into three portions, of which the upper is the broadest and flattened; head and throat bare, the latter and the crop expansile; legs longish and four-toed, the front webbed at their base as far as the first joint, the hind toe very long, all provided with claws.

3. **LIMOSA** (Lat. *limus*, mud). Beak thrice as long as the head, more or less curved upwards, soft and flexible, depressed, and flattened towards the point, which is obtuse and smooth; the upper mandible longer than the lower, both grooved throughout their whole length; nostrils at the root of the beak, linear, and pierced in the grooves from side to side; legs long and slender, above each knee a naked space; three toes before and one behind, the middle connected with the outer by membrane as far as the first joint, the hind toe short, its tip just reaching the ground; wings of moderate length, the first quill-feather the longest.

4. **NUMENIUS.** Beak long, slender, arched, and compressed, its tip hard and slightly obtuse; upper mandible extending beyond the lower, rounded towards the tip, grooved through three-fourths of its length; nostrils lateral, linear, and situated in the grooves; space between eye and beak covered with feathers; legs slender, naked above the knee; three toes in front, connected as far as the first joint, one behind articulated on the tarsus, and touching the ground.

5. **PHALAROPUS** (Gr. *φαλαρίς*, a marsh-bird, and *πούς*, a foot). Beak long, straight, slender, depressed at the base; both mandibles grooved to the point; the tip of the upper obtuse, and curved upon the lower; nostrils basal, lateral, oval, prominent, and encircled with membrane; legs slender, and the tarsi compressed; toes, three in front connected with membrane to the first joint, the remainder of their edges fringed with scalloped, broad membranes, one behind articulated on the inner side and membraneless.

6. **RECURVIROSTRA** (Lat. *recurvus*, bent back, and *rostrum*, a beak). Beak very long, slender, weak, depressed throughout its whole length, with its point flexible and curving upwards; upper mandible grooved on its upper, and the lower on its lateral surface; nostrils long and linear; wings pointed; legs long and slender, having three toes in front and a very short one behind (connected as far as the second joint with a scalloped membrane), attached high up on the tarsus.

7. **RHYNCHÆA** (Gr. *ῥύγχος*, a beak). Beak compressed, longer than the head, expanded and bent towards the tip; mandibles of equal length and slightly curved, the upper grooved throughout its whole length, the lower only at its point; nostrils lateral, linear, and pierced completely through; tarsus longer than the middle toe, naked and reticulated; front toes unconnected; hind toe articulated on the tarsus above the others.

8. **SCOLOPAX** (Gr. *σκόλοπαξ*, a bird which never sits on a tree). Beak with its ridge elevated at the base, compressed, slender, long, straight, blunt, and its tip swelling; both mandibles grooved for half their length, and the point of the upper longer than the lower, and its swelling part forming a kind of hook; head compressed; eyes large and set far back; nostrils pierced longitudinally near the edge of the mandible, lateral, basal, and covered with membrane; legs slender and feathered to the knee; three toes in front, generally distinct.

9. *STREPSILAS* (Gr. στρέψω, *I turn*, and λίς, *a stone*). Beak of moderate size, slender, straight, tapering conically to the tip, which is hard, straight, and truncated; nostrils basal, lateral, half closed by membrane, and completely piercing through the beak, of which the nasal channel occupies half the length; legs of moderate size, slight, and a little bare above the knees; three toes in front, connected by a very short membrane, and one behind touching the ground; wings acuminate, the first quill the longest.

10. *TOTANUS* (Ital. *totano*). Beak of moderate length, oblong, slender, straight, and rarely curving upwards, soft at the base, hard, solid, and cutting at the pointed tip, and compressed throughout its whole length; both mandibles grooved only at their base, and the tip of the upper curving slightly upon the lower; nostrils lateral, linear, and pierced in the grooves; legs long, slender, and naked above the knee; three toes in front and one behind, the middle and outer connected by membrane often so far as the second joint.

11. *TRINGA*. Beak of moderate size, slightly arched, soft and flexible throughout its entire length, compressed at the base, and depressed, dilated, and blunt at the tip; both mandibles grooved nearly to the point; nostrils lateral, conical, and piercing the membrane which covers the nasal groove; legs slender, and naked above the knee; front toes completely divided and edged with a narrow membrane; hind toe articulated on the tarsus.

LONGIROSTRES.—DESCRIPTION OF THE SPECIES.

HIMANTOPUS—*Long Legs*. These birds have longer legs than any other bird; they measure, from the knee to the foot, about seven inches; whilst the body, when stripped of its feathers, very little, if at all, exceeds that of a Thrush. Their wings are large, and they fly with great rapidity. They are found in all parts of the world, more especially in Africa, but are by no means numerous, and live either on the sea-shore or among the marshes, feeding on worms and insects.

There are but two species known:—The *Long-legged Plover* (*H. Melanopterus*), and the *Black-necked Long Legs* (*H. Nigricollis*).

IBIS. Ibises are found in all parts of the world, except Australia, but more especially in warm climates, from whence they sometimes migrate, and are occasionally met with in Germany, Holland, and England. They feed upon insects, worms, testaceous animals, and sometimes even on small fishes. The Ibises perform a powerful and elevated flight, extending their neck and legs horizontally with their body, and occasionally uttering hoarse, bass croakings. When they settle, they are observed huddling close together, and for hours employed raking up the mud with their beak, advancing very slowly, and not with the rapidity of the Curlew; and while thus engaged they usually rest upon one leg only. They build mostly on high trees, and feed their young in the nest till they can fly.

There are about fifteen species or more. The *True Ibis* (*I. Religiosa*), about the size of a fowl, and the *Glossy Ibis* (*I. Falcinellus*), nearly two feet in length, were adored by the ancient Egyptians, and of which numerous mummies are found.

LIMOSA—*Godwit*. The Godwits are easily distinguished from the Woodcocks and Snipes, among which they were included by Linnæus, by their curved beak, smooth at its point, by the more forward position of the eyes, by their standing higher, and by the membrane connecting the middle with the outer toe. And no less do they differ from them in their habits; for whilst the Woodcock lives almost entirely in the woods, and the Snipes among the fresh marshes, the Godwits are found about the mouths of rivers, and more rarely by the sea-side; like the others, however, they feed on worms, groping for them in the mud thrown up by the sea, for which purpose their soft and sensible beak admirably adapts them. They are extremely timid, being disturbed by the least noise, when they fly off, uttering a cry which resembles the smothered bleating of a goat. During the daytime they keep close, but at twilight are busily employed boring the mud with their long bills. They do not remain long in the same place, so that it often happens, that although they have been seen in numbers in the evening, the next morning they are not to be found. Godwits are birds of passage,

making their appearance at the same time as Woodcocks; they are subjected to the double moult, and it is a curious circumstance that the females moult much later than the males; and it may also be noted that the females are much the larger birds. The species number about eight or nine.

NUMENIUS—*Curlew*. The birds forming this genus were included by Linnæus among the *Scolopaces*, and by others among the *Ibes*, from both of which, however, they distinctly differ both in form and habits. They are very shy, frequent the sea-coast and districts covered with dry mud, but always in the neighbourhood of water or marsh, feeding on earth-worms, slugs, terrestrial and aqueous insects. During summer they retire to mountainous and unfrequented parts, where they pair and breed. They emigrate in large flocks, but during breeding-time live only in pairs; their flight is high and long continued. They moult but once a year; and the only distinction between the young and old birds is the slighter curve and shortness of the beak of the former.

Species—the *Curlew* (*N. Arquatus*), two feet in length, and sometimes more; breadth three feet and a half; bill five inches long, upper mandible blackish-brown, lower flesh-coloured; plumage light ash. It is a bird of passage on the Dutch, French, and English coasts, and very common in many parts of Europe. The *Whimbrel* (*N. Phæopus*), a bird less common on the English coasts than the Curlew. They visit Spalding, where they are called *Curlew Knots*, in large flocks in April, but leave that place in May. The *Long-billed Curlew* (*N. Longirostris*), and the *Esquimaux Curlew* (*N. Borealis*), both known in the neighbourhood of Hudson's Bay.

PHALAROPUS. These birds are principally found in or near the great lakes, and on the sea-coast of the Arctic regions. They form one of the links connecting the Wading and Web-footed Orders, having the form of the Sandpipers with some of the habits of the Gulls, and are covered with a thick coat of feathers, the roots of which are embedded in down like those of the Ducks. They run badly, but swim with much grace and swiftness, and have no more dread of the waves of the sea than of those of rivers and lakes. They feed on small insects and marine worms. They are not numerous, and are generally seen only in pairs. There are four species.

RECURVIROSTRA. There are four species, one of each being found in Europe, Africa, America, and New Holland. Their flight is rapid; they live on mud-banks at the mouths of rivers; and their food consists of insects and the spawn of crustaceous animals.

RHYNCHÆA. Similar to the Woodcocks: colours bright; native of Madagascar, the Cape, and India.

SCOLOPAX—*Woodcock, Snipe*. This genus, which consists of thirteen species, is composed of three sections:—1. *Woodcocks* (*Rusticolæ*). Whole thigh feathered as in land birds; eyes set far back and near the crown, giving the head a square form; belly barred. 2. *Snipes* (*Scolopaces*). Lower part of the thigh featherless; eyes and form of the head as in the Woodcocks; belly generally white and not barred. 3. *Long-beaks* (*Macrorampli*). Middle and outer toes united by membrane as far as the first joint.

The habits of these sections vary in some degree; those of the first preferring the swamps in woody districts, whilst the species forming the other two sections are found in the open marshes, and some even upon the sea-coast. Their food consists principally of worms and beetles, which the sensitive skin covering their beaks enables them to dig out of the soft mud; and their bills are further adapted for this mode of taking their food, which is commonly called *boring*, by the adaptation of some muscles at the root of the mandibles in such a manner as to open them at their tips like the forceps used for the microscope. There is great similarity in the plumage of this genus, which is subject to a double moulting annually, and is most brilliant in summer-time. They mostly lead a solitary life, moving about in pairs. A few remain stationary throughout the year, but the greater number are birds of passage twice a year, moving from south to north in the spring, and from north to south in the autumn. When arrived in the country where they intend to winter, it is curious to observe that they are constantly changing their stations, and this change seems dependent on the weather; so that whilst to-day they may be found in great numbers among the marshes, yet to-morrow these tracts will be completely deserted, and the birds are

found only on the highest moorland ranges, having chosen the twilight of the preceding night to make their departure. The nest of the Woodcock consists merely of a shallow hole lined with dried grass: early in spring the female deposits four eggs of a yellowish-white colour, blotched with pale chestnut-brown; she sits very close, and will not leave her nest although very closely approached. The young leave the nest as soon as hatched; but on the appearance of any danger the parent bird flutters her wings, endeavouring, like the Partridge, to attract notice to herself whilst her young escape.

The earliest appearance of the Woodcock on its autumnal visit to this country generally occurs towards the latter end of September or the beginning of October; few, however, of these remain, the greater proportion passing onwards towards Portugal, and thence to their most southern destination, Africa. Successive flights continue during the two following months, but as the distance they fly is continually shortening, they are gradually spread over the whole country, at least in such parts of it as suit their peculiar habits; the south-western coasts of England and Ireland being the districts first settled by them, whilst those which are found in the northern counties rarely appear before the latter end of November or the beginning of December.

STREPSILAS—Turnstone. This genus consists of a single species (*S. Interpres*), which was included among the *Tringa* of Linnaeus, although without any similarity in the form of its beak or in its habits, till separated by Illiger. It is spread nearly over the whole globe, but is generally migratory, its principal breeding-places being the shores of Hudson's Bay and of the Arctic Sea. It is rather more than nine inches in length.

TOTANUS—Sandpiper. This genus is distinguished from the *Tringa* and *Limosa*, in which the lengthened nasal pits render their beak very flexible, and, together with its soft tip, fit for probing in soft mud and feeling the prey, by having the beak hard and its point sharp to adapt it for groping among gravel and stones on hard ground. Their food is principally conchiferous molluscs, insects, worms, and sometimes small fish. They move about in small flocks, live indifferently on the edges of lakes and streams, and in meadows adjoining fresh water, but rarely are found on the sea-coast, or on muddy shores of rivers. They moult twice a year, but the summer plumage differs from the winter only in the different distribution of the spots and streaks, and sometimes merely in these being of brighter hue. The females are rather larger than the males. When first disturbed they are very noisy, a single bird giving the alarm to the rest; and they protect their young by feigning lameness, so as to draw away the intruder from their helpless charge. There are about thirteen species, which are divided into *True Sandpipers*, and *Sandpipers with the beaks turned up*.

TRINGA—Sandpiper. Much difficulty has arisen in assigning a specific character to the individuals belonging to this genus, on account of the great variety of plumage arising out of its change of colours in their annual double moult, the plumage of summer differing materially from that with which each bird is clothed in winter. Hence have been described many species which more close observation has shown to be merely the same bird differently feathered at different times of the year. The principal variations of colour, Selby observes, are from white to reddish-brown, and from grey to black; and in this respect they are similarly circumstanced to the *Numenius*, *Scolopaces*, and *Totani*. The colours of the sexes are nearly alike, but the female is largest. They live in small flocks in marshy districts, either near the sea, or along the banks of rivers and lakes where they principally seek their food, consisting of insects and their larvæ, of worms, molluscs, and small bivalves, upon the surface among the weeds when left by the recession of the tide; but they do not much employ their beak for boring, as it is less sensible than in those birds which have this habit. They almost invariably resort to high northern latitudes in the spring, for the purpose of incubation, and return southward in autumn; but some remain stationary throughout the year. As in many other instances, so also in this, systematic writers have, without any very satisfactory reason, subdivided the genus into many groups, assigning to them generic characters scarcely distinguishable, and which in reality are merely the gradations by which one genus is connected with another. The species are in number about sixteen or eighteen.

Family—LONG-TOED; Macroductyla.

The Macroductyla are characterised by the length of their toes, which adapt them for walking upon aquatic herbage, and in some cases for swimming. Their wings are short and flight feeble.

ILLUSTRATIVE EXAMPLES.

PLATE 15.

Genera.	Species.	Common Name.
Parra - - - -	Chinensis - - - -	Chinese Jacana.
Palamedea - - - -	Cornuta - - - -	Horned Screamer.
Megapodius - - - -	Freyineti - - - -	Freyinet's Mankiro.
Porphyrio - - - -	Pulverulentus - - - -	Sultana-bird.
Chionis - - - -	Necrophaga - - - -	White Sheathbill.
Phœnicopterus - - - -	Ruber - - - -	Red Flamingo.
Glareola - - - -	Torquata - - - -	Collared Pratincole.

Other Genera of this Family:—Fulica, Gallinula, Rallus.

CHARACTERS OF THE GENERA.

1. **PARRA** (the Latin name of an unknown bird). Beak as long as the head, straight, slender, compressed; base flattened, and extending back from it upon the forehead a horny membrane; mandibles of unequal length; nostrils oval, lateral, opening in a linear slit in the middle of the beak, and perforating it; wings large, and armed with a spur; legs very long, slender, and uncovered with feathers to near the trunk; toes very long, slender, and entirely distinct from each other; claws straight, that of the hind toe the longest, all grooved beneath.

2. **PALAMEDEA**. Head small, having on the forehead a delicate cylindrical horn; beak short, thickish, conical, straight, curved at the point; upper mandible vaulted and the nasal pit large; lower mandible shorter than the upper and obtuse; nostrils distant from the base of the bill, oval and patulous; wings large, furnished with two long spurs; legs short and strong, the tibiae but little bare; toes very long, the lateral united to the middle, which is the longest, by a short membrane, the hind toe the shortest.

3. **MEGAPODIUS** (Gr. μέγας, *great*, and πούς, *a foot*). Beak slender, weak, straight; lower mandible straight, its tip hidden within the elongated edges of the upper; nostrils distant from the base, and very near the tip, ovoid and open; ocular circlet bare; neck with but few feathers; tail cuneiform, short, in one species there is no tail; legs large, strong, set far back on the body; tarsi twice the length of the middle toe, covered with large scales; toes straight, hind one resting on the ground, the anterior toes of equal length, the inner united at the base, the outer divided; claws very long, slightly curved, trigonal, and depressed.

4. **PORPHYRIO** (Gr. πορφύρα, *purple*). Beak short, strong, thick, conical, and nearly as deep as it is long; ridge of the upper mandible depressed and dilated close to the skull; nostrils lateral, nearly round, entirely open, and placed near the ridge; legs long, strong; toes sometimes of great length, all edged with very narrow membranes.

5. **CHIONIS** (Gr. χιών, *snow*). Beak strong, thick, hard, conically convex, compressed, curved towards the tip; upper mandible half-covered from its base with a longitudinally-folded and moveable horny sheath, projecting a little beyond the anterior ridge of which, in the middle, are the nostrils; lower mandible smooth, and forming an open angle; only a small part of the tibiae naked; toes edged with a rudimentary membrane; the middle and outer one half-webbed, the inner connected only at the base.

6. **PHŒNICOPTERUS** (Gr. φοῖνιξ, *red*, and πτέρυξ, *a wing*). Beak naked at its base, large, strong, of greater depth than its width, toothed and conical at the tip; upper mandible suddenly curved downwards upon the point of the lower, which is widest; nostrils longitudinal, in the middle of the beak, piercing through it and near the ridge, and covered with membrane; legs very long, four-toed, the front three toes connected by membrane to the nails, which are short and flat.

7. **GLAREOLA**. Beak short, thickish, compressed; upper mandible curved at point, slightly arched; gape wide; nostrils basal, linear, oblique; wings long and pointed; legs moderately long, four-toed, three before and

one behind, the latter touching the ground, the former connected by a short web; tail forked.

8. *FULICA*. Beak straight, short, thickish, and compressed laterally; of greater depth than breadth at its base; the upper edge of the upper mandible dilated into a broad, callous plate upon the forehead, and the lateral edges grooved towards the base; the upper mandible slightly arched, the lower angular; nostrils lateral and longitudinal, placed in the middle of the beak, and partly covered by membrane; legs long and slender, bare below the knee; toes very long, connected at their base, and covered with a broad fin-shaped scolloped membrane; nails shorter than the toe, and hooked.

9. *GALLINULA*. Beak short, compressed, conical; deeper than its width at the base; the ridge of the beak sometimes expanding into a naked plate on the forehead; mandibles of equal length, much compressed at the tip, the upper slightly curved, the lower angular; nasal pits very large, nostrils lateral, longitudinal, partly covered by membrane; legs long, naked above the knees; toes very long, three before and one behind, those in front edged with a narrow membrane.

10. *RALLUS* (Lat. *rarus*, thin). Beak long, slender, slightly arched, or straight, compressed at its base, with its tip roundish; the upper mandible grooved, and the nostrils situated in it lateral, partly covered by membrane, and perforated completely through; wings rounded; legs long, stout, and bare a short distance above the knee; front toes entirely distinct.

MACRODACTYLA.—DESCRIPTION OF THE SPECIES.

PARRA—Jacana. The birds forming this genus are in the Brazils called *Jacanas*, which signifies water-fowl, and in Paraguay *Aquapeazos*, from their stepping lightly on the broad leaves of water-plants. They are noisy, querulous, and active, moving about from morning to night. They run with great speed along the weed-covered surface of pools, and upon high grass, the length of their toes preventing them from slipping down, and compensating in this respect, at least, for webs; but they are fond of paddling up to their knees in the water. They feed on water-insects, are monogamous, make their nest on the ground among the grass, and there deposit four or five eggs. In consequence of the spur on their wings, or the length and sharpness of the nails, these birds have been trivially called *Surgeons*. The species are divided into two subgenera: 1, those with a frontal membrane; and 2, those without a frontal membrane.

The species are—the *Common Jacana*, rather larger than a Water Rail, and much taller; common in all the hot parts of America; the *Bronzed Jacana* (P. *Ænea*), found on the Continent of India and in Java: in the latter country it is called by the natives *Pichisan*, and in Bengal is known as the *Coudey*, *Peepe*, *Mova*, or *Dulpee*; the *Cinnamon Jacana*, from Senegal; the *Chilian Jacana* (P. *Chilensis*); and the *Gallinaceous Jacana*, found in the Celebes, and at Amboina, is a bird of passage.

The *Chinese Jacana* (P. *Chinensis*), Plate 16, is about twenty inches in length, and as large as the Chinese Pheasant; head, throat, front of the neck, and wing-coverts white; the back of the neck ornamented with some golden-yellow silky feathers; rest of the plumage chestnut, tinged with vinous red, except a large white spot on the upper part of the wings and the edge of the secondaries; at the tip of some of the alar quills a little pedicular appendage; four of the caudal quills black, much longer than the body, and elegantly curved.

PALAMEDEA—Kamichi. The Kamichis, in many respects, resemble the *Jacanas*, but are of much larger size; they are rather rare, and found only in the inundated districts of South America; never enter the great forests, and but occasionally are seen perched on the dead branches of trees, as they prefer the ground: their cry is very loud and can be heard at a considerable distance, and is said to resemble *vyhu, vyhu*. They generally feed on aquatic herbs and seeds, and, it is stated, also on reptiles. They never use their offensive weapons, the horn and long claws, except in their contests with each other during pairing-time, and when once mated they continue monogamous during life.

The species represented on Plate 16 (P. *Cornuta*), or *Horned Screamer*, is about the size of a Turkey, which it resembles in the shape of its body;

it stands about three feet four inches high, and the wings nearly reach the tip of the tail, which is square; the full-grown bird has the plumage of the neck, back, chest, wings, and tail, slaty-black; the belly is white; the frontal horn is moveable, three inches long; the middle toe is four and a half inches long, the outer, but two; legs and feet black.

MEGAPODIUS. The *Megapodes*, of which there are five species, are found in the Moluccas, the Papou, Marianna, and Philippine Isles; in the latter they are called *Tavon*, which in the Tagal language signifies to bury, because they deposit their eggs in the mud, and, covering them with mud and leaves, leave them, like the Ostrich, to be hatched in the heat of the sun. They live on the edge of the large forests bordering the sea-shore, and at the least alarm betake themselves to cover, running with an unsteady pace, and their flight is little more than fluttering along the ground.

One species, *M. Freycinetus* (Plate 16), the *Mankirio* of the Papous, is about fourteen inches long; the whole body is blackish-brown, becoming lighter on the belly and wings; the feathers on the head capable of elevation into a kind of crest; the skin of the neck nearly naked; the great alar quills meet upon a little oval tail, not exceeding an inch in length; the head small, the beak about ten lines in length, brownish, with a white tip, and surrounded by a black skin at its base, which, as well as the ocular circlet, has a few scattered feathers upon it. The tarsi stout, and two and a half inches long, covered by deep brown scales; of the three front toes, the middle is the longest, measures two inches, is united to the inner by a broad, and to the outer by a narrow membrane, the hind toe rests on the ground throughout its whole length; the nails black. This bird is found in the Papou Isles.

PORPHYRIO—Water-hen. This genus is distinguished from the *Gallinules* by its body not being so compressed nor of so elegant a form; by the very strong beak, composed of a substance so hard, that it enables them easily to break up the shells of seeds; and by their legs, which are furnished with very long toes, capable of speedy retraction, and armed with claws, which enable them to grasp and carry their food to their mouth. Their plumage is generally bright blue. They live constantly by the soft waters, and also in the marshes and rice-grounds of the south of Europe, walk with great elegance on the water, and run with speed upon land or on the tops of water-plants. As they prefer grain to water-plants for food, they are found more upon land than are the *Gallinules*. The species are—the *Purple*, eighteen inches long; the *Green-backed*, seventeen inches; the *Black-backed*, nearly sixteen inches; the *Green*, twelve; the *White*, which is the largest, twenty; and the *Sultana-bird* (P. *Pulverulentus*), called also the *Dusty Water-hen*, fourteen and a half inches. (Plate 16.)

CHIONIS—the *VAGINALIS* of Latham—*Sheathbill*. This remarkable bird, the *White Sheathbill* (Plate 16), was first discovered at New Zealand by Forster, who gave it the name *Chionis*. It measures from fifteen to eighteen inches in length, and is about the size of a large pigeon; base of the beak black, space between the beak and eyes, and around the latter, covered with white or pale orange warty excrescences, but one above the eye brown or black; irides dull leaden; entire plumage white, tubercle on the bend of the wing blunt and blackish, legs reddish, claws black.

PHENICOPTERUS—Flamingo. These beautiful birds are found in all parts of the world, living on the borders of the sea or of ponds, where they feed on shell-fish, insects, and the spawn of fish. Their neck is of correspondent length with their legs, and though the head is small their beak is very large, and in taking food they turn the beak, so that the upper mandible serves the office of a scoop. They migrate at least from Europe every spring, and return in the latter part of summer. Their body is not covered with down like the true swimming-birds, and although their feet are webbed they rarely swim. They fly in flocks, forming, like the Geese, an angular wedge, the sharp point of which is occupied by the leading bird. And in walking they often place the flat part of their upper mandible on the ground, for the purpose of obtaining an additional support.

Species—the *Red Flamingo*, figured on Plate 16; the *Chilian Flamingo*; and the *Lesser Flamingo*.

The *Red Flamingo* is about four feet four inches in length; the head, neck, tail, and under parts rose-colour, as also are the back and scapulars; wings bright red, the secondaries extending some inches beyond the primaries, which are deep black; ocular circle and base of the beak whitish, middle of the beak blood-red, and its extremity black; legs rose-colour. The Flamingos are common in the warm parts of Asia and Africa, also in Sardinia, Sicily, and Calabria in the neighbourhood of the marshes, and in the southern parts of Provence and in Spain; very rarely they are met with on the Rhine. They build their nests in shallow ponds, where there is much mud, which they scrape together, making little hillocks, like small islands appearing out of the water, a foot and a half high from the bottom. They never lay more than two eggs, and seldom fewer.

GLAREOLA—Pratincole. The European species (*G. Torquata*), known as the *Collared*, or *Austrian Pratincole* (Plate 16), is about the size of a Blackbird; bill black and short; lower mandible red at the base; upper parts brown, inclining to rufous on the head and neck; throat brownish-buff, separated from the neck by a black line, which, commencing from the front of the eye, descends before the auriculars, and encircles the throat; below it to the breast the feathers are pale reddish-brown; under parts, rump, and tail, white; primaries dark brown, secondaries paler, tipped with white; legs long, bare above the knee, toes brown.

FULICA—Coot. This genus is admirably adapted for the water, on which it continually lives, very rarely coming ashore; they are both excellent swimmers and divers, and they live principally on aquatic vegetables. The upper part of the plumage greyish-black, except the outer edges of the wings and a spot under each, which are white; under parts ashy-blue, with a hoary tinge; beak white, with a greenish tinge; the callous frontal membrane white, which inclines to red in the breeding season; legs ashy, but yellowish above the knee.

GALLINULA. The *Gallinule* have their bodies much compressed; they stoop much forwards, which enables them to run with considerable speed, not only on shore, but also along the leaves and weeds spread on the surface of the water, and even among rushes, for which the great expansion of their toes is admirably adapted. They live in marshy districts, and are excellent divers; their food is vegetables, and frequently also insects.

The species are—the *Land-Rail* or *Corn-Crake* (*G. Crex*); the *Spotted Gallinule* (*G. Porzana*); the *Olivaceous Gallinule* (*G. Pusilla*); the *Little Gallinule* (*G. Baillonii*); and the *Common Gallinule* (*G. Chloropus*).

The first-named species (*Corn-Crake*) is a native of Europe, and visits Great Britain during the spring and summer months, but leaves it before winter; it is very common in the Isle of Anglesea and in Ireland. It runs extremely fast, rarely takes wing, except when pushed to the last extremity, when it flies but for a short distance, and then dropping, takes again to running; and if overtaken by the dogs, will sometimes squat and be passed over by them in the eagerness of pursuit. In those districts where Quails are found it appears about the same time with them, and has thence been called the king of the Quails.

RALLUS—Rail. There is little real difference between this genus and the *Gallinules*, except that in the former the beak is longer than the head, whilst in the latter it is shorter; but even in this respect the transition is so gradual that it is difficult to determine the limits of each. There are about twenty species, of which only one is found in Europe.

Sir W. Jardine observes that the feathers of the forehead and crown of the Rails are so formed as to defend them from the friction of the strong grass and reeds among which they constantly run: the tip of the stem of each feather being lengthened and widened into a flat sharp point resembling a lengthened scale, and in one or two species the feathers consist only of this stem, giving the whole forehead a horny appearance. The body of the Rails is much compressed and very flat. They run much more than they fly, and escape pursuit by swimming across narrow pieces of water. They live in marshes covered with grass, reeds, and shrubs, in the neighbourhood of fresh water; and feed on worms, slugs, insects without wing-cases, and on vegetables and their seeds. There is but one species.

ORDER VI.—PALMIPEDA. WEB-FOOTED.

THIS Order is characterised by the adaptation of their legs and feet for swimming: their legs are placed far back on the body; the tarsi is short and compressed, and their toes are webbed. Their neck is longer than their legs, by which they are enabled to dip far into the water in quest of food; and their plumage is close, downy, and unctuous.

Family—SHORT-WINGED, OR DIVERS; *Brachyptera*.

These Birds walk with difficulty, owing to the backward position of their legs, hence they maintain an upright posture when on land; their wings are remarkably short and feeble; they swim beneath the surface of the water, their wings aiding them like fins.

ILLUSTRATIVE EXAMPLES.

PLATE 16.

Genera.	Species.	Common Name.
Podiceps - - -	Cornutus - - -	Horned Grebe.
Podia - - -	Senegalensis - - -	Senegal Coot-grebe.
Colymbus - - -	Glacialis - - -	Northern Diver.
Fratercula - - -	Mormon - - -	Puffin.
Alca - - -	Impennis - - -	Great Auk.
Aptenodytes - - -	Patagonica - - -	Patagonian Penguin.

Other Genera of this Family:—*Eudytes*, *Phaleris*, *Spheniscus*, *Uria*.

CHARACTERS OF THE GENERA.

1. **PODICEPS** (Gr. *ποῦς*, a foot). Beak of moderate size, firm, compressed, and rather of an elongated conical form; tip of the upper mandible rather inclined, of the lower angular nostrils lateral, concave, oblong, closed behind by membranes, open in front, and perforating from side to side; no tail; legs long, set far back; tarsi much compressed; three toes in front much flattened, connected at their base, and each encircled in a festooned membrane; claws broad and very flat.

2. **PODOA** (Gr. *ποῦς*, a foot, and *ῥα*, a fringe). Beak of equal length with the head, straight, cylindrical, pointed, inclined towards the tip, which is notched; edges of the upper mandible rather expanded; lower mandible straight, and angular towards the tip; nasal groove large and long; nostrils lateral, and penetrating through the beak; tail very wide; legs short, and set far into the belly; tarsi round; three front toes connected by a festooned membrane; hind toe smooth.

3. **COLYMBUS** (Gr. *κολυμβάω*, I swim). Beak smooth, straight, compressed, and pointed; the nostrils linear; tail none; legs flat, thin, and serrated behind; feet tetradactyle, the outer toe the longest, the toes lobated.

4. **FRATERCULA**. Beak longer than the head, slender, and very much compressed at the tip; the lower mandible more or less curved and pointed; and the nostrils open in two tubes close to the surface of the beak.

5. **ALCA**. Beak of various lengths and form in the different species, generally compressed; feathers at the nostrils; wings very short; legs very short; toes three, fully webbed.

6. **APTENODYTES** (Gr. *ἀ*, privative, *πτηνός*, winged, and *ὑρτης*, urinator). Bill strong, straight, more or less bending towards the point; wings very small, covered with compact short thick feathers, having broad shafts pendulous and unfit for flight; legs short and thick, placed further behind than in any other bird, throwing the weight on the tarsus, which is very large like the sole of the foot of a quadruped, and containing three bones to which the anterior toes are connected, which are webbed; there is a loose toe behind.

7. **EUDYTES** (Gr. *εὖ*, with ease, and *ὑρτης*, urinator). Bill thickish, straight, slightly compressed, and gradually curved at the tip; upper mandible longest, but the edges of both inclined inwards; nostrils linear, and half closed with membrane; tongue long, pointed, and serrated near its base; wings and tail very short, the latter consisting of twenty feathers; legs compressed; feet turned outwards, four-toed, the middle one the longest, the anterior three webbed to the claws, the back toe joined to the internal leg or thin membrane.

8. *PIHALERIS* (Gr. *φαλήρις*, a sea bird). Beak much shorter than the head, depressed, dilated at the sides, almost quadrangular, and notched at the point; lower mandible angular; nostrils in the middle of the beak, marginal, linear, partly closed above and behind, and piercing through the beak; legs very short; tarsi slender, and having only three toes, all in front, with much-curved claws.

9. *SPHENISCUS* (Gr. *σφηνίσκος*, a little wedge). Beak shorter than the head, compressed, very large, strong, hard, straight, curved at the tip, and grooved obliquely; the edges of both mandibles bent inwards, the lower feathered at its base, and obtuse at the tip; nasal pit very small, nostrils opening in the middle of the beak; wings unfeathered; legs very short, thick, and drawn up to the belly; four toes in front, three of which are connected, and the inner one having the very short thumb attached to it.

10. *URIA*. Beak of moderate length, stout, straight, pointed, and compressed; upper mandible slightly curved towards the tip; lower mandible more or less angular; nostrils basal, lateral, concave, and longitudinal, half covered with a feathered membrane, and undivided; wings short; legs short, retracted into the belly; tarsi slender; three toes in front completely webbed; no hind toe.

BRACHYPTERA.—DESCRIPTION OF THE SPECIES.

PODICEPS—*Grebe*. The plumage of this genus varies considerably according to age, and has caused great confusion in determining the species. They swim with great readiness on the surface of the water, and are also excellent divers, in the latter case employing their short wings as a pair of oars. Their gait is awkward, owing to their legs being set so far behind the centre of gravity that their body is with difficulty sustained in the upright posture. They are common on the sides of rivers and ponds, where there is plenty of flags and rushes, and more rarely are found on the sea-coast. They feed on fish, on insects which have wing-cases, on worms, vegetables.

There are eleven species, one of which, the *Horned Grebe* (*P. Cornutus*), is figured on Plate 17. This species measures from twelve to thirteen inches in length; the crown and ruff, which are very wide, deep shining black; above and behind each eye a large tuft of ferruginous feathers, forming a pair of horns; space between the upper mandible and eye, the neck and chest, brilliant ferruginous; nape and upper parts blackish; under parts white, and the flanks tinged with ferruginous; secondary alar quills white; base of the beak rose-coloured, the remainder of it black, except the tip, which is red; legs black externally, and grey on their inner side; inner margin of the iris yellow, the outer bright red. Till the young birds have become a twelve-month old, they have neither horns nor ruff. It is more common in the eastern and northern parts of Europe, but not unfrequent in England, rare in Germany, and only accidentally in France, Holland, and Switzerland. It builds among the rushes, to which it attaches its floating nest, and lays three white eggs spotted with brown.

PODOA. There are two species, the *Surinam Grebe-coot* (*P. Surinamensis*), about the size of our Black-chinned Grebe, and the *Senegal Coot-grebe* (*P. Senegalensis*), Plate 16. The upper part of the neck and body, wings and tail are brown, inclining to black on the head and upper part of the neck; the sides of the latter, as also the back and flanks, spotted with black; from the beak a white stripe extends above the eye, along the side of the throat and neck, the front of which is white, as are also the chest and belly; tail-quills graduated, stiff, rather narrow, and their stems orange-coloured; beak and legs red. Native of Senegal.

COLYMBUS—*Grebe*. These birds inhabit marshy districts, building their nests among the rushes, but loose upon the water, with which they rise and fall. Their flesh is very rank; but in consequence of the beautiful metallic lustre of their plumage, the skins are manufactured into muffs and tippets. The species includes the *Great-crested Grebe* (*C. Cristatus*), which is about the size of a Goose, and is very common in the fens of Shropshire and Cheshire, and the East Fen in Lincolnshire, where they are called *Gaunts*. It is a very careful nurse, feeding its young with small Eels, and when tired carrying them on its back or under its wings. The *Tippet Grebe*, Pen., is considered to be the young of this species.

This genus, according to Willughby and Linnaeus, included both the Grebes and the Divers, but they have been separated by Brisson.

A notice of the *Northern Diver*, figured as *Columbus Glacialis*, will be found under *EUDYTES* below.

FRATERCULA. The birds of this genus live in rabbit and rat holes, and only come out at twilight, or during violent storms, when they follow the wake of ships, and their flight is so rapid and their turnings so quick, that it is almost impossible to follow them; in clear weather, however, they are rarely seen. In their general form and habits they resemble the *Guillemots* (family *Uria*), and the *Razor-bills* (*Auks*, family *Alca*).

The Puffins (illustrated on Plate 16) are extensively spread throughout the northern circle, whence they migrate southwards in the beginning of winter.

The *Puffin* (*F. Mormon*) is black on the crown of the head, and upper parts of the body, also a black collar surrounds the neck; the horny appendages to the eyelids are leaden-grey; the cheeks pearl-grey; bill deeply furrowed, blue at the base, the rest of the bill orange; legs also orange. Its length is about thirteen inches.

ALCA. The birds of this genus are well adapted for swimming; their wings serve them as paddles rather than organs of flight. There are several species, of which the *Great Auk* (*A. Impennis*) is one. This bird (Plate 16) is larger than a Goose: it is a native of the arctic regions, being frequently found on the coasts of Norway and Iceland, Greenland, and Spitzbergen. It breeds on the ledges of precipices, in caves and deep fissures; the female lays but one great egg, which is spotted with purple. These birds are of a dusky-slate colour, throat black in summer and white in winter; under plumage white, bill and legs dull black. They live on fish and various crustacea—the lump-fish forming its favourite prey.

APTENODYTES—*Penguin*. The anterior extremities of the Penguin can hardly be called wings; they are neither adapted for flight, nor are they intended for it, being solely employed by the bird in “rowing itself along with its finny wings as with oars,” whilst the head and neck only appear out of the water, in which respect it differs from all other birds which swim on the surface. The feathers of these birds are very close, so that the wet cannot penetrate, and they are generally extremely fat, whence the name given to them by the Dutch, *Pengouin*, from *pinguis*, fat, and since employed as a generic term by Pennant and Latham. It lives much at sea, and has been found as far as seven hundred leagues from land; it rarely comes on shore but to lay its eggs, and gets to its nest with difficulty by crawling on its belly. The largest species known is the *Patagonian Penguin* (*A. Patagonica*), measuring four feet three inches in length, and standing three feet high; the wings hazel; the head, throat, and back of the neck brown; the back ash-coloured, the under parts quite white; on each side of the neck is a broad stripe of yellow, only seen when the neck is extended; for as the bird generally sits with the head shrugged between the shoulders, it appears only as a thin necklace. It lives in large flocks in the neighbourhood of the Straits of Magellan, as far as New Guinea, and feeds on fish, crabs, shell-fish, &c.

EUDYTES—*Diver*. These birds very much resemble in the web of their feet the family of the *Totipalmes*, and by the form of their bodies connect them with the Grebes (*Colymbæ*), from which they have been separated. They are natives of the northern regions, and rarely build in our climate, but occasionally visit our coasts in winter. They are broad, flat, and long-bodied, and swim in a squat position.

There are three species, the *Northern*, *Black-throated*, and *Red-throated Diver*.

The *Northern Diver* (*E. Glacialis*, or, according to Linnaeus, *Colymbus Glacialis*), Plate 16, is about three feet six inches in length, and four feet eight inches in breadth; it is said to weigh occasionally sixteen pounds, but probably this size and weight are exaggerated. The bill is long and black; head and neck deep black, glossed with green and purple; neck striped; the back black and spotted with white; breast and belly white; quills and tail black, as are also the legs, which are set far back and adapted for swimming. The Northern Diver inhabits the north of Europe, and seldom visits us, except in very hard winters.

PHALERIS—*Starick*. The birds of this genus are about the size of a quail; they are found, some in North America, some in Japan, and some in Northern Asia. They were formerly included in the genus *Alca* by Pallas, but separated from it by Temminck on account of the quadrangular form and less curving of the beak, which is not partially feathered as in the *Alca*; to these, however, as well as to the *Uria* and *Mormones*, they are very closely allied.

SPHENISCUS. This genus is distinguished from *Aptenodytes*, from which it was separated by Brisson, by the shortness of its beak, by its upper mandible not being grooved longitudinally but obliquely, by its small nasal pit, and by the base of its lower mandible being feathered instead of covered only by a naked skin. There are four species.

URIA—*Guillemot*. The birds forming this genus have a general resemblance to the Divers, *Colymbi* of Linnaeus; from which, however, they were separated by Brisson, on account of the absence of the hind toe, and the shortness of their wings. Their flight is but for a short distance, and only just above the surface of the water. They dive extremely well, using their wings as a pair of oars, and continue under water for a considerable time, where they are engaged in pursuit of fish, which they follow with great speed. They live in high northern latitudes, in large flocks, migrating southwards during winter, but rarely below Great Britain; and keep constantly by the sea-side or upon the ice, only coming to land at breeding-time, when they deposit their usually single egg in some hole or crevice of a rock without the preparation of a nest. Five species.

Family—LONG-WINGED; *Longipennata*.

These Birds possess the capability of protracted flight; they are met almost on every part of the high seas: their wings are of great length; they want the hinder toe or thumb.

ILLUSTRATIVE EXAMPLES.

PLATE 17.

Genera.	Species.	Common Name.
Procellaria - - - -	Hartie - - - -	Hartie's Petrel.
Haladroma - - - -	Berardi - - - -	Berard's Haladrome.
Pachyptila - - - -	Vittata - - - -	Broad-billed Pion.
Dromedea - - - -	Exulans - - - -	Wandering Albatross.
Larus - - - -	Marinus - - - -	Black-backed Gull.
Rhyncops - - - -	Nigra - - - -	Black Skimmer.

Other Genera of this Family:—*Lestris*, *Sterna*.

CHARACTERS OF THE GENERA.

1. **PROCELLARIA** (Lat. *procella*, a storm). Beak of moderate size, strong, tough, sharp, depressed, and dilated at the base, but its point compressed and arched, and both mandibles grooved and suddenly curved towards the tip; nostrils prominent on the surface of the mandible, united and concealed in a tube opening by one or two apertures; wings long; legs of moderate length or long, slender, and the tarsi compressed; three toes in front, long, and completely webbed; instead of a hind toe a very sharp claw.

2. **HALADROMA** (Gr. *ἅλς*, the sea, and *δρέμω*, I run). Beak strong, compressed, straight, the tip hooked; a groove on each side of the upper mandible; nostrils double; throat dilatable; wings long, fit for flying; legs short, turned outwards, three-toed, webbed; claws curved and sharp.

3. **PACHYPTILA** (Gr. *παχὺ*, thick, and *πτίλον*, a feather). General characters the same as those of *Procellaria*, with which they were included by Gmelin, till separated from them by Lacepède and Illiger on account of the cartilaginous plaits on the inner edge of their mandibles similar to those of the Duck tribe, and their imperfectly-webbed feet.

4. **DIOMEDEA**. Beak large, strong, and bending in the middle; the upper mandible hooked down; nostrils opening forward, short, and covered with a large convex guard; no thumb to the foot; tongue very small.

5. **LARUS**. Beak longish, compressed, strong, hard, and cutting, tip curved; nostrils in the midst of the beak, lateral, narrow, longitudinal,

with one exception, the *L. Marinus*, in which they are roundish, and open from one to the other; legs slender, and naked above the knee; tarsi long; the three front toes completely webbed; hind toe small, high up on the tarsus, and free; wings long; tail-quills equal.

6. **RHYNCOPS** (Gr. *ῥύγχος*, a beak, and *κόπτω*, to cut). Beak long, straight, and much compressed; upper mandible shorter than the lower, slightly truncated, its sides closely approximated, so as to leave only a groove in which the lower is received; lower mandible much truncated, its sides or branches only distinct close to the base, but otherwise closely approximated and forming a single plate, which is sharp beneath like a knife-blade; nostrils longitudinal, narrow, concave, patulous, and near the base in the edges of the mandible; wings very long, the second quill-feather much the longest; tarsi naked and reticulated, and longer than the middle toe, which is connected to the others by webs; hind toe articulated to the tarsus, and its tip just touching the ground.

7. **LESTRIS** (Gr. *ληστρίς*, a robber). Beak of moderate size, strong, hard, somewhat cylindrical, compressed, curved, and hooked at the top; nostrils narrow, diagonal, covered behind with a horny plate, and perforated from side to side; wings long; the middle two tail-quills exceeding the others in length; legs slender, naked above the knee; tarsi as large as the middle toe; three toes in front completely webbed, hind toe free, about one-third the length of the middle toe.

8. **STERNA**. Beak longer than the head, nearly straight, compressed, slender, and tapering; mandibles of equal length, the upper rather inclined towards the point, and the lower having a prominent angle towards its middle; nostrils rather behind the middle of the beak, linear, and communicating; wings very long; tail forked; legs small, slender, naked above the knee; tarsus shorter than the middle toe, feet four-toed, the front three connected by a more or less scalloped web, but the hind one free; claws sharp and arched, that of the middle thrice as large as those of the lateral toes.

LONGIPENNATA.—DESCRIPTION OF THE SPECIES.

PROCELLARIA—*Petrel*. The birds forming this genus seem naturally divided into three sections from the peculiarity in their nasal organs: in the first the nostrils open by a single orifice; in the second by two tubes; and in the third by one tube with two apertures. They are mostly natives of northern climes; are rarely seen except in very tempestuous weather during daytime, and only leave the deserted rabbit or rat holes in which they live at twilight, or when the aurora borealis makes its appearance. They are always found in the seas where cetaceous animals are numerous, many of them feeding on the parasites with which that class are infested; and in the event of heavy storms they fly for shelter to the ships which may chance to be within their neighbourhood, and hence have acquired the name of Storm Birds, which is applied to some of their species more especially. Whilst flying they keep so close to the surface of the water, rising and stooping with the waves, that they have been thought to walk on the water, and hence their name *Petrel* or *Little Peter*; but it is very rare that they rest on the surface of the sea, and if they do it is always with expanded wings. They feed on the flesh of cetaceous animals, also on their parasites, and mollusca, insects, and the worms which float on the surface of the water. And they possess a peculiar power of ejecting from their nostrils an oily fluid on any one who meddles with them.

They are divided into three sections, as already stated, viz., *True Petrels*, *Puffin Petrels*, and *Swallow Petrels*. They vary in size from that of a Pigeon to a Goose. The *Giant Petrel* is called by sailors Mother Cary's Goose. *Hartie's Petrel* (Plate 17) is an illustration of the genus.

HALADROMA. The birds of this genus very much resemble the Petrels in their general figure and beak, and the Cormorants in their pouch-like throat; but, like the Albatrosses, they have no hind toe. They are extremely good divers.

Berard's Haladrome or *Petrel* (Plate 17) is about eight inches long; has the head, cheeks, upper part of the neck and wings, the back and tail deep glossy black; upper part of the throat, chest, and belly white; on each

side of the body a black patch inclines towards the middle of the chest; beak black spotted with white; legs long and lead-coloured. Found in the Falkland Isles.

PACHYPTILA. The species illustrated is the *Broad-billed Prion* (*P. Vittata*), which is about the size of a small Pigeon, and thirteen inches in length; the upper part of the body ashy-blue, and becoming deeper on the head and wings, through the latter of which, and across the back near the base of the tail, passes one blackish band, and across the top of the tail another; the sides of the head and the under part of the body and wings white; the middle quills of the tail are rather longer than the outer, and give it a rounded appearance; beak and eyes leaden-blue; the middle of the upper mandible and the nasal tubes blackish; the legs black. These birds were seen by Captain Cook in the South Seas between 28° and 30° of latitude; numerous flocks of them followed him from the Cape of Good Hope to 41°, then to 51°, and at last as high as 58°; and in this high latitude they have also been noted by the French naturalists Lesson and Garnot.

DIOMEDEA—Albatross. The birds composing this genus are the largest of all the water birds; they inhabit all the South and North Seas, and live upon the spawn of fish and mollusca.

The *Wandering Albatross* (*D. Exulans*) is larger than a Swan, being about three or four feet in length; its bill of a dirty yellow; crown of the head pale cinereous brown; body white, crossed on the back and wings with blackish lines and spots towards the tail, which is lead-colour; greater quills black; legs flesh-colour. The bird is known amongst the English sailors by the name of *Frigate Bird*, and by the French as the *Mouton du Cap*, on account of its white body and black wings. It makes its nest on high ground, and lays many eggs, which are considered good eating. The Albatross is very common without the Tropics, and is found not only towards the South Pole, but even as high as Kamtschatka and Behring's Straits, northward; it is also found about the Cape of Good Hope.

LARUS—Gull. The Gulls are spread very generally over the globe, but are most numerous in the northern regions, and generally on the sea-shore; some species, however, are found on the inland lakes and the banks of rivers. They commonly feed on fish, dead or alive, carrion, and offal; and in the north a large part of their food is derived from dead Whales and other cetaceous animals, but some few species feed principally on insects. They are exceedingly voracious, a natural consequence of their being often exposed to long-continued privation, which they endure well, a proof of which occurred in one who lived nine days without food; and if one of them finds any food, he is beset by his fellows, who drive him about and tease him with loud screams till he drops it. In appearance they are dull, heavy birds, and their gait is so also; but their close plumage renders them extremely good swimmers, and in rough weather they may often be noticed tossing on the waves, upon which they frequently repose: they are continually flying about, and are often met with at considerable distance from land, and it is considered that their buoyancy enables them to rest as they float on the surface of the sea. They frequent the mouths of rivers in winter-time, and when, as occasionally, they go far inland, it is esteemed a sign of hard weather. They are gregarious, but the young do not mingle with the old birds, flocking together by themselves. They have a harsh, shrill cry or scream, and hence arises the name *Sea-Mew*, which is not unfrequently applied to them both in England and Germany, where they are called *Mew*, or *Mewen*, and hence the French have derived their name for them, *Mauve*. They build their nests either among the cliffs or merely in a hole scratched on the beach. In the young birds, brown or ash colour predominates, and they rarely attain their full plumage till the second or third year. The plumage varies in the winter and summer; for the head, which in summer is in many instances of a black, brown, or dark colour, is in winter either ashy or white. There are fifteen or sixteen species.

The illustrated species is the *Black-backed Gull* (*L. Marinus*), and is nearly twenty-five inches in length; top of the head, ocular region, back of the head and neck white, but each feather streaked longitudinally in the middle with light brown; the upper part of the back, scapulars, and whole

wing deep black; the rest of the back, the forehead, and all the under parts white; beak whitish-yellow, angle of lower mandible bright red; naked margin of the eyes red; irides bright yellow, marbled with brown; legs dirty white.

RHYNCOS—Cutwater. This genus exhibits one of the most remarkable forms of beak in the whole class of birds. (See Generic Character.) They live on sand-banks and in salt-marshes, are found usually in parties of fifteen or twenty pairs, and make their nest by forming slight hollows in the sand at no great distance apart. They walk badly, and do not swim much, but are continually on the wing, skimming over the surface of shallow water near the shore where the fry of fishes and shrimps resort; hence has arisen the name of *Skimmer* applied to them by Pennant. They move along with a slow, flapping flight, and with extended wings and bended neck, dip the lower mandible, the mouth being at the same time open, and plough along the surface of the water for the purpose of taking their food, which they capture with as much ease as Swallows take their insect prey. From their thus cutting through the water with their bill they were called by the American Spaniards *Rayador*, or cutters, and hence probably originated Catesby's name, *Cutwater*. They are found both in America and Africa.

Species—the *Black Cutwater* (*R. Nigra*), nineteen inches in length; breadth three feet eight inches when the wings are expanded; upper mandible three and a half, and under mandible four and a half inches long, both scarlet, tinged with orange and tipped with black; upper part of the head, neck, back, and scapulars deep black, as are also the wings; forehead, cheeks, throat, and under parts white; tail-feathers black, broadly edged with white, their coverts white on the outer sides, and black in the middle; legs and feet bright scarlet. It is found on both sides of the American continent, and in both hemispheres.

LESTRIS—Skua. The Skuas are very courageous birds; they attack the Gulls, and compel them to drop the food they have fished up, which they catch with great dexterity before it reaches the water. They fly in a very peculiar manner, darting along, so as to be easily distinguished at a distance. They are natives of the Arctic regions, the Orkneys, and Hebrides, and rarely come southward.

STERNA—Tern. The Terns appear to assume among water birds the place of the Fissirostral family of Passerine birds, especially the Swallows, from the great length of their wings, their forked tail, and small feet, and hence they have acquired the popular name of *Sea Swallows*. Some of them feed entirely upon mollusca and small fishes, but others only upon winged and aquatic insects; the latter are rarely seen upon the sea-coast, to which the former constantly resort. They herd together in large flocks, and their nests are often so closely set that the sitting birds touch each other. They undergo a double moult, but the change is confined to the region of the head. Their distribution over the earth's surface is very general, as they are found both in hot and cold climates, but from the latter they migrate during winter. The species are numerous.

Family—SPLAY-FOOTED; *Steganopoda*.

The Birds belonging to this family fly well; their legs are short, and their feet are converted into paddles by the union of the thumb with the other toes—a single membrane connecting all.

ILLUSTRATIVE EXAMPLES.

PLATE 18.

Genera.	Species.	Common Name.
Pelecanus	Onocratalus	Common Pelican.
Carbo	Cormoranus	Cormorant.
Tachypetes	Aquilus	Great Frigate-bird.
Sula	Alba	White Gannet.
Platus	Levaillantii	Le Vaillant's Dartar.
Phaeton	Phenicurus	Red-tailed Tropic-bird.

CHARACTERS OF THE GENERA.

1. **PELECANUS.** Beak long, straight, wide, and much depressed; upper mandible very flat, its point armed with a very strong, much-curved, com-

pressed hook; lower mandible consisting of two long, flexible branches connected at the tip, and having attached throughout their whole length a naked, pendulous skin in form of a bag; nostrils basal, consisting of longitudinal slits; legs short and strong; the hind toe articulated internally on the same plane as the other three, and all connected in a single web; claw of the middle toe not serrated.

2. CARBO—a subgenus of HALIEUS (Gr. ἁλιεύς, *a fisher*). Beak generally exceeding the length of the head, straight and compressed; upper mandible much curved towards the point and hooked; its ridge rounded; lower compressed; base surrounded by a membrane which extends naked on the throat, and forms a pouch; nostrils near the root of the bill linear and hidden; cheeks and throat naked; wings adapted for flying; tail wedge-shaped; legs short, strong, set far back, three toes in front, and the fourth facing inwards completely webbed, the outer toe directed almost immediately forwards; claw of the middle toe serrated.

3. TACHYPETES (Gr. ταχυπέρης, *quick flying*). Beak long, stout, cutting, depressed at the base and swelling on the sides; points of both mandibles strongly curved, the upper ending in a very pointed hook; nostrils in grooves, linear; orbits naked; throat dilatable in the male; wings very long and narrow; tail long and deeply forked; legs very short; tarsus rather more than a fourth as long as the middle toe, and only feathered half its length; three front toes half webbed, the thumb toe articulated inside and directed forwards.

4. SULA. Beak longer than the head, stout, large at base, straight, compressed at tip, which is slightly curved; edges of the mandibles serrated; nostrils basal, linear, covered posteriorly with membrane, and opening behind the middle of the beak with a narrow oblong aperture; face and throat naked; tail conical, and composed of twelve quills; wings long; legs turned outwards, strong, short, and much drawn into the belly, four-toed, three in front, of which the claw of the middle one is serrated, and the hind toe attached to the inner side, all connected by membrane.

5. PLATUS (Gr. πλατύς, *broad*). Beak long, straight, slender, and pointed, its tip finely toothed; edges of the upper mandible dilated at the base, but otherwise compressed and inclined inwards; lower mandible shorter than the upper; nostrils linear and concealed in a slight groove; wings long; tail very long; legs short, strong, and set far back; tarsus shorter than the middle and outer toe which are of equal length, all the toes enclosed in a single web.

6. PHAETON. Beak as long as the head, strong, bulky, compressed, cutting, convex above, tip pointed, toothed on the edges; nostrils basal, lateral, covered above and near the base with naked membrane, and piercing through the beak; wings very long; tail short, except two quills, which are very long and slender; legs very short; anterior toes long, hind toe short, and articulated on the inside, all included in the same membrane.

STEGANOPODA.—DESCRIPTION OF THE SPECIES.

PELECANUS—*Pelican*. The size of the birds of this genus exceeds that of the Swan, and it would be the largest of the water birds were it not for the great length of the legs of the Flamingo, and the bulk of the Albatross. Pelicans are very remarkable for the great size of their pouch, which consists of a loose skin depending from the branches of the lower jaw, and which is sufficiently large to hold two gallons and a half of water; hence it has been called by the Egyptians the *Water Camel*: in consequence of the flexibility of the lower jaw the bird is able to expand the orifice like the mouth of a casting-net. In feeding, it takes up a large quantity of fish, and, as might be supposed, at the same time much water, but it retracts the pouch and gets rid of the water before swallowing its food. Pelicans fly with considerable rapidity, much more than could be expected from their size; but this is explained by the fact of their bones and numerous bags in the loose membrane connecting the skin and the body being filled with air, which tends much, as in other quick-flying birds, to diminish their specific gravity. They are also very remarkable for the power they possess of perching on trees, in which respect, however, they resemble some of the Geese, the Cormorants, and the Anhingas. Five species.

The *Great Pelican* (*P. Onocrotalus*), Plate 18, is about five or six feet in length, and sometimes more; all the plumage white tinged with rose-colour, except the quill-feathers, which are black; the naked face roseate-white; the pouch light yellow; legs fleshy colour; tail consisting of twenty feathers; from the back of the head extends a tuft of long and slender feathers; the hook on the tip of the beak red, resembling a blood-stain, and hence probably has originated the legend of the Pelican feeding her young with her own blood. It is a native of the eastern countries of Europe; is common in Hungary and Russia, in Africa, on the banks of the Senegal and Gambia (where the Negroes call them *Pokko*), on the coasts of Angola, Sierra Leone, and Madagascar; at Siam, in China, the Isles of Sonda, the Philippines, and Manillas; and in America, from the Antilles to Louisiana, and the neighbourhood of Hudson's Bay, and also in the southern parts of Australia.

CARBO (subgenus of HALIEUS)—*Cormorant*. Two divisions may be fairly made of this genus—the *True Cormorants*, which have fourteen quill-feathers to the tail, and the *Shags*, which have only twelve; but, although this seems to be the only difference, it is observed that they never associate; and, with regard to their breeding, the Cormorants build their nests on the tops of the cliffs, whilst the Shags are content with holes in the rocks much lower down. In character, the whole genus is sullen and heavy; the eye, however, is remarkably keen; and when hungry they are very active, but having satisfied themselves they squat lazily and inactively till hunger induces their wonted activity in search of food.

The *True Cormorant* (*Carbo Cormoranus*) is usually about two feet and a half, but sometimes it attains more than three feet; the bill about five inches long, of a dusky colour; throat surrounded with a white collar, the extremities of which reach below each eye; the throat-pouch yellow; head, neck, chest, under parts, and rump iridescent greenish-black; the feathers of the back ashy-brown in the middle, and edged with a broad black margin; the alar and caudal quills black, the latter fourteen in number, stiff and strong; the legs short, the outer toe about four inches long, and placed almost directly forward. They are common in all the northern parts of the world upon the sea-coast, and feed voraciously on fish, more especially, it is said, on Eels. In Greenland, the natives make use of their throat-pouch as bladders for floating their fishing darts.

TACHYPETES—*Frigate Bird* (*T. Aquilus*). The total length from the tip of the bill to that of the tail three feet, of which the dirty yellowish-white beak is four and a half and the tail sixteen inches long at its outer edge, whilst the quills at the bottom of the fork are only seven and a half long; transverse extent when the wings are expanded six feet ten inches, including five inches the width of the body; the throat and lower part of the long neck naked as far as the breast in the male; the skin of this part bright red, and granular whilst undistended, but when expanded with air during flight it is smooth and about the size of a hen's egg. The general colour of the plumage in the male is black, inclining to glossy green on the back, and his feet are black; in the female the plumage is more dusky, and she has nearly the whole head and belly white, with bluish-white feet. The *Frigate Bird*, *Man-of-War Bird*, *Sea Eagle*, and *Halcyon*, by all of which names it is known to sailors, is commonly found between the tropics, but in summer frequently visits Carolina. "The most striking peculiarity of this genus consists," as Mr. Burton has well observed, "in the disproportion which exists between the wings and the other extremities; a disproportion so enormous as probably not to be found in any other, if we except the Ostrich and Cassowary, (to which also the Emeu may be added,) where it is reversed;" the extreme extent from the tip of one to that of the other expanded wing being six feet ten inches, whilst the extreme length of the leg, from the true knee to the junction of the toes with the tarsal bone, does not exceed three inches, of which the latter bone measures only half an inch, and the hind limbs, indeed, are actually much shorter even than this, from being much drawn up into the skinny covering of the belly; the consequence of which is that if the bird once drop to the ground it is unable, from this extreme shortness of the legs, to raise itself up to flight, and therefore when it settles, it always rests upon some high rock or

other projection, from which, by throwing itself, it may be able to take flight.

SULA—*Gannet*. This genus formed part of the Linnæan genus *Pelecanus*, from which, however, it is distinguished by several characters, and has therefore been separated by Brisson. It appears to connect *Pelecanus* with *Tachypetes* and *Phaeton*.

The Gannets are almost constantly on the wing, but they rarely swim nor ever dive, strictly speaking, although when pursuing their fishy prey they drop down upon it from a considerable height through some feet of water; when on shore and at rest they use their caudal quills as a third prop to give them support as do the Cormorants. During breeding-time they collect in large flocks upon the rocks overhanging the sea. They have acquired their French name *Fou*, and their common English one *Booby*, from their presumed stupidity in allowing themselves to be attacked both by man and by other birds.

The *White Gannet* (*S. Alba*), Plate 18, is from two feet seven to ten inches in length; beak ashy-blue at the base, but white at the tip; irides yellow; naked skin surrounding the eyes light-bluish, but that beneath the chin, and extending to the middle of the throat, is blackish-blue; crown of the head, occiput, and upper part of the neck pale ochrish-yellow, the rest of the plumage milk-white, excepting the bastard wings, which are black; front of the tarsi and upper surface of the toes pale green; toe membranes blackish, the claws white. The female differs only in being smaller. The plumage just described is the adult of three years.

The Gannet is common to the Arctic regions, both of the old and new world, is very abundant in the Hebrides, Scotland, and Norway; is a bird of passage in England and on the Dutch coast, where it only occasionally appears in very hard winters. Many of the young are taken on the Bass Rock, at the mouth of the Frith of Forth, not only for their down, but also for the flesh, which, although oily and rank, is, when roasted, much esteemed in Scotland as a good whet before dinner. They afford considerable profit, and hence, upon the Bass Rock, which lets for 60*l.* or 70*l.* a-year, the old ones are not allowed to be destroyed; and during the months of May and June the rock is so thickly covered with nests, eggs, and young birds, that it is scarcely possible to move without treading on them. Their flocks are so great that when flying they darken the sky, and their noise is such as to render it scarcely possible to hold a conversation.

PLATUS—*Darter*. These birds are found in the hottest parts of Africa and America, living on the banks of rivers at some distance from the coast, and feeding on fish. The small size of their head and their long slender neck give them somewhat the appearance of a snake joined to the body of a bird. According to Vieillot there are but two species, the *White-bellied* and the *Black-bellied Darter*.

Le Vaillant's Darter (Plate 18) is that denominated the *Black-bellied Darter*. It is about three feet in length; head and neck light ferruginous, or mingled with brown; throat whitish; a white streak passes from the angle of the beak half down the neck; the scapulars, which are very long, and the secondary quills nearest the body, are marked longitudinally with silvery-white, and their edges are deep black; part of the front of the neck, the chest, and under parts shining-black; the rest of the plumage and tail entirely black. The female is only distinguished by being of a lighter tint. It is found in Senegal, at the Cape of Good Hope, and the Indian Archipelago.

PHAETON—*Tropic Bird*. The birds forming this genus are only found between the tropics of Cancer and Capricorn, and hence afford a certain proof to the spectator that he is within the Equatorial zone. Our sailors commonly call them Tropic Birds; whilst the French give them the name *Paille en queue*, from the two long feathers resembling straws which project beyond the other tail feathers. Their flight is very elegant, as they glide along almost without moving their wings. Their food consists entirely of fish, and their long tail-quills are used as ornaments among the South Sea islanders.

The *Red-tailed* species (*P. Phœnicurus*) is about thirteen inches in length from the tip of the beak to the root of the tail, which measures five inches

more; the general colour of the plumage is satin-like white; in front of the eye a large black spot, and behind it another smaller one; the flanks marked with blackish; legs white tinged with bluish; front of the webbing of the feet black. It is most common in the Indian Seas.

Family—PLAITED-BILLED; *Lamellirostrata*.

The *Lamellirostrata* have a thick bill, covered with skin; the edges of the bill are furnished with small teeth; they have a large fleshy tongue, with denticulated border; their wings are of moderate length; they live more commonly in fresh water than in the sea; they have a very muscular gizzard.

ILLUSTRATIVE EXAMPLES.

PLATE 19.

Genera.	Species.	Common Name.
Cygnus - - -	Musicus - - -	Wild Swan.
Anser - - -	Ferus - - -	Wild Goose.
Cereopsis - - -	Novæ Hollandiæ - - -	New Holland Pigeon-goose.
Anas - - -	Clypeata - - -	Shoveller.
Hydrobates - - -	Lobatus - - -	Lobated Duck.
Mergus - - -	Mergansur - - -	Goosander.

CHARACTERS OF THE GENERA.

1. **CYGNUS**. Beak of the same breadth throughout, but of greater height than width at its base, and sometimes tuberculated; the edges of the mandibles denticulated, the upper mandible rounded, its point curved and obtuse; the lower shorter and flat; nostrils in the middle of the beak; space between the beak and eyes naked; neck very long; feet webbed, and placed behind the centre of gravity of the body; the middle toe the longest.

2. **ANSER**. Beak about as long as the head, conical and elevated at the base; nostrils large, near the centre of the beak, and pierced through; legs long, in the middle of the body; hind toe free, jointed on the tarsus.

3. **CEREOPSIS**. Beak short, elevated, obtuse, and covered with a cere, or membrane; nostrils on the cere; legs long, and bare above the tarsal joint; feet webbed, but not so much as in geese; large and ample wings.

4. **ANAS**. Bill broad at base, wide at the end, slightly hooked; neck not so long as that of the goose; legs short, and placed back in the body.

5. **HYDROBATES**. General characters as above.

6. **MERGUS** (*Lat. mergo*, I dive). Beak of moderate length, slender, straight, roundish, with the base thicker, and the cere covered; tip of the upper mandible much curved and hook-like; lower mandible smaller than the upper; edges of both mandibles toothed like a saw, and the teeth inclined backward; nostrils lateral, elliptical, longitudinal, covered by a common membrane, and perforated through and through; legs short, strong, turned out, retracted towards the belly; tarsus a third shorter than the middle toe; three toes in front completely webbed, the outer the longest, hind toe free, about the length of one joint of the others, and resting on its tip; wings moderately large.

LAMELLIROSTRATA.—DESCRIPTION OF THE SPECIES.

CYGNUS—*Swan*. Swans live almost entirely on the water, the position of their feet making them bad walkers and comparatively defenceless on land, whilst on their own element they are very powerful. They live principally upon grain and aquatic plants; the little tooth-like plaits in their mandibles enabling them to crop the latter substances, and at the same time allowing the water to escape; but they also eat frogs, leeches, and small fishes. They are monogamous, living with a single female, and build their nests on the ground by the water side; the *Cygnets*, or young Swans, swim as soon as they are hatched, and find their own food. Swans are very long lived, frequently, it is said, attaining the age of a hundred years. They afford us the article called *Swansdown*, which is much esteemed for its fineness, and employed in the manufacture of tippets and muffis.

The *Tame Swan* (*C. Mansuetus*) is the largest of our English birds; it

is about four feet and a half in length from the tip of the beak to that of the tail; over the root of the upper mandible is a black callous protuberance, whence Bechstein has called it the *Tuberculated Swan* (C. Gibbus). The female is not quite so large, and has the frontal protuberance less than the male. They have become domesticated, and in our own country are commonly seen in private grounds where there is much water, to which they are great ornaments, no bird having command of such beautiful attitudes.

“The *Swan*, with arched neck
Between her white wings mantling, proudly rows
Her state with oary feet.”

Formerly they were highly esteemed in England, and it was ordered by an Act of Edward IV. c. 6, that no one who possessed a freehold of less clear yearly value than five marks should be permitted to keep any, other than the son of our Sovereign Lord the King. And subsequently by an Act of the 11th of Henry VIII. c. 17, the taking of Swans' eggs was punished by imprisonment for a year and a day, and a fine at the king's pleasure. It is still felony to steal the eggs, but it is necessary in order to make the felony that the bird should have been marked on the beak with a red-hot iron; these marks (of which in an old manuscript at Oxford as many as 304 are enumerated belonging to various families) are different, that of the king consisting of three vertical nicks. From this circumstance originated the custom of *Swan-hopping*, or *Swan-umping* as it is called, according to the Rev. Mr. Weston, in the “*Archæologia*,” xvi. 163, from the City of London Companies going up the river Thames to brand their Swans. Mr. Weston's opinion of the sign of the Swan with two necks having originally been that of “the Swan with two nicks” may be noticed, *en passant*, as explaining one of the numerous popular misnomers which have produced so many curious and absurd sign-paintings.

The Swan, though inoffensive when not meddled with, is very pugnacious when disturbed; striking so violently with its wings, as to do material mischief to any one who is so foolish as to provoke it when in the water. Amongst their own species two males will frequently fight for a female, and the contest does not terminate without the destruction of one of them.

The nests of Swans are built upon the ground, on the retired banks of lakes or rivers, and are formed of dried leaves or rushes. The birds begin to lay in February, and continue to do so every other day till they have laid six or seven eggs: the time of setting is about six weeks, the female alone remaining on the nest, and when she leaves it carefully covering up the eggs with feathers and rushes; during this time the male constantly tends and protects her from injury. During the season of incubation they are extremely dangerous, and very courageous. Dr. Latham mentions an interesting anecdote on this subject: “At Pewsey in Buckinghamshire, whilst a Swan was on the nest she observed a Fox swimming towards her from the opposite shore, when she darted into the water, and having kept the Fox at bay for a considerable time with her wings, at last succeeded in drowning him in the sight of several spectators.” The *Cygnets* are able to walk in the next November; and when they begin to swim, it is said that the male parent holds them up by the head, and the female by the tail; but when they have acquired this accomplishment, the parents desert them, and they find mates amongst themselves.

The *Wild Swan* (C. Ferus), which was formerly called the Elk, Hooper, or Whistling Swan, differs from the Tame Swan in having the beak black, with the edges and root and the skin between the eyes and the irides yellow; the neck straight; the plumage white with a yellowish tinge, and the bastard wing armed with a curved horny spur, which, however, is not seen till the feathers are plucked; legs black. But the great distinction consists in the windpipe; in this bird it is coiled up in the keel of the breast bone, which is very deep, whilst in that of the Tame Swan it is straight, and the keel of the breast bone narrow.

It is to this species that the ancients imputed the melodious note which has become proverbial (C. Musicus), Plate 19; but this is none other than a poetical fiction, originating in the Swan having been sacred to Apollo and the Muses, and thence supposed to be musical. The song, such as it is, of

the Swan may be noted, according to M. Mongez, by *mi fa* and *re mi*, upon the latter of which they rest for a long time; these cries are uttered morning and evening, and whenever the bird is particularly excited.

Swans are very good swimmers, and move so fast in the water that a person walking at a smart pace cannot keep up with them; and they have equal powers of flight, during which the motion of their wings produces a loud sonorous noise, which may be heard at a great distance, and which is considered by Sonnini to have given origin to the notion that Swans sing.

ANSER—Goose. Some of the species of this genus so closely approximate to the Swans, that the difference cannot easily be distinguished. There are several species, including the *Snow Goose* (A. Hyperboreus) of North America; the *Grey-lag Goose* (A. Cinereus), the origin of the tame Goose, now rare in the British Isles; the *White-fronted Goose* (A. Albifrons), which visits us in winter; the *Bean Goose*, which breeds in Ireland; the *Canada Goose* (Anser Canadensis); the *Egyptian Goose*, and the *Bernicle Goose*. The *Wild Goose* is figured on Plate 19. The genus is so well known as not to require a lengthened description.

CEREOPSIS. The type of this genus is the bird (C. Novæ Hollandiæ), figured on Plate 19. It is a beautiful bird: it possesses all the characteristics which separate the Geese from the Ducks, and is about the size of a common Goose; it is of a dingy gray colour, and has a broad patch of white on the top of its head; most of the wing-coverts are marked with round dusky spots; the naked part of the bill, which is very short, is black; the broadly-expanded cere is a light straw or lemon colour; irides hazel; legs orange.

The *New Holland Pigeon Goose* frequents grassy districts and the shore, but rarely enters the water. It is easily domesticated.

ANAS—Duck. Ducks very much resemble Geese in their general conformation and many of their habits. The divisions of this genus are: the *Scoters*, the *Garrots*, the *Eiders*, the *Pochards*, the *Shovellers*, the *Shield-rakes*, and the *Mergansers*. The *Shoveller* (A. Clypeata—the Ryncaspis of Leach) is about twenty inches in length, and is a very beautiful bird. The upper mandible of its long beak forms a perfect half cylinder, widened at the end, and is of a leaden-grey colour; head and neck green; eyes yellow; breast white; flanks rufous; back brown; wings varied with white, ash-grey, and brown. It is a native of the northern regions, and being a bird of passage visits this country in the spring. Its flesh is so excellent that many consider it superior to that of the Wild Duck. (Plate 19.)

HYDROBATES. The species, figured on Plate 19, is the *Lobated Duck* (H. Lobatus), and exhibits the general characteristics and habits of the Duck tribe, so well known.

MERGUS—Goosander (M. Merganser). This bird is about two feet four inches long, and three feet two inches wide; the head and upper part of the back black; the lower part of the neck, chest, belly, wing-coverts, and outer scapulars, white tinged with yellowish-rose colour; the inner scapulars and upper part of the back black, the lower part and tail ash; primaries black, great coverts edged with black; beak deep red, its hooked extremity black; iris reddish-brown or red; legs deep orange; the male has also a short, large, black tuft on the back of the head. The female is known commonly as the *Dun Diver*, or *Sparling Fowl*.

The Goosanders bear great resemblance to the Geese, from which, however, they are distinguished by the narrowness and hooking of the bill; they live upon the water, and swim with their bodies deeply sunk and their heads only above the surface; they dive and swim under water with great ease, and employ their wings as oars; their gait is unsteady on account of their legs being set so far back, but they fly with great quickness and for a long time. They feed on fish and amphibious animals. They live in the cold regions, and are noticed in the more temperate climes only during winter, when they appear in great numbers. They moult only once a year, the old males in autumn, and the females in spring: the young males before their first or second moult resemble the females.

CLASS III.—REPTILIA.

Reptiles are cold-blooded Animals. Their heart is so constructed, that at each contraction only a small portion of the blood is sent into the lungs, while the greater quantity passes into the general circulation, without having been subjected to the process of respiration in those organs: hence they are destitute of the vivacity and muscular energy of warm-blooded Animals, whether Mammalia or Aves. Their movements are slow, and their habits sluggish: their digestion is destitute of vigour, and their sensations are obtuse. Throughout the winter, in cold and temperate latitudes, they remain in a state of torpidity. They are either covered with scales, or only with a naked skin: they can remain a long time submerged, owing to the smallness of their pulmonary vessels; and they are more varied in their form, gait, and characters, than the preceding Classes. The females have a double ovary, and two oviducts: they never incubate their eggs.

ORDER I.—CHELONIA. TURTLES.

THE Turtles are better known by the appellation of Tortoises. They are enveloped in two bony bucklers, the upper one being called the *carapace* or shield, and the under one the *plastron* or breast-plate. They have a heart with two auricles, and a ventricle with two chambers, communicating with one another.

ILLUSTRATIVE EXAMPLES.

PLATE 1.

Genera.	Species.	Common Name.
Testudo - - -	Græca - - -	Common Tortoise.
Emys - - -	Scripta - - -	Written Fresh-water Tortoise.
Sternotherus - -	Trifasciatus - -	Three-striped Box Tortoise.
Chelonia - - -	Virgata - - -	Striped Turtle.
Chelys - - -	Matamata - - -	Matamata.
Trionyx - - -	Nilotica - - -	Nilotic Trionyx or Soft Tortoise.

CHARACTERS OF THE GENERA.

1. **TESTUDO** (Lat. *testa*, a shell). Back-plate and breast-plate firmly united, the former arched, the latter nearly flat; dorsal plates thirteen, pectoral twelve; head and legs retractile within the back-plate; head deep, obtuse; jaws horny, serrated; legs club-like; toes immovable, enveloped in a common skin, five in front and four behind, their nails large, conical, blunt, and attached around the front of the extremity of each foot.

2. **EMYS**. Breast-plate consisting of two equal-sized pieces moving on each other, or of two unequal-sized pieces, of which the anterior only is moveable, or of three pieces, of which the anterior and posterior move upon the fixed middle piece; beak horny; scales of the disc thirteen; toes distinct, slightly webbed, and furnished with long, sharp claws.

3. **STERNOTHERUS**. Characters as above; that part only of the breast-plate being moveable, which is anterior to its bony junction with the back-plate.

4. **CHELONIA**. Bony covering too small to receive the head and feet; feet long, especially the fore feet; toes united by a membrane. The several pieces of the *Plastron* not well denticulated, the intervals of which are filled with cartilage.

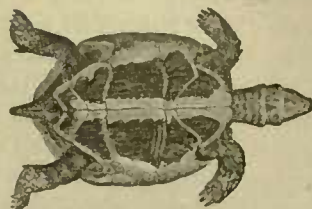
5. **CHELYS**. Envelope small; head and feet large; elongated nose; mouth widely cleft.

6. **TRIONYX**. Back and breast-plate not completely sustained by bone, but covered with a soft skin; lips fleshy; muzzle elongated and trumpet-shaped; neck long and completely retractile; tail short, and the vent opening at its extremity; feet not lengthy but webbed, each furnished with three clawed toes.

CHELONIA.—DESCRIPTION OF THE SPECIES.

TESTUDO—*Land Tortoise*. These animals are found in almost all parts of the world except Australia, living in dry districts, and during winter bury themselves deep in the earth. On account of the shortness of their legs they move slowly and awkwardly. They feed on vegetables and fruit, and lay but few eggs, which, however, have hard, unyielding, calcareous shells, and are deposited in holes in the ground.

The largest of the species is the *Indian Tortoise* (*T. Indica*), its back-plate measuring from three feet to four feet five inches; and the smallest and most elegant of the family is the *Geometric Tortoise*, which is generally about five and a half inches in length, four in width, and three and a half in height. The sizes of the other species range between these.



Tortoise: under surface.

The illustrated specimen, the *Common Tortoise* (*T. Græca*), is from ten to twelve inches in length, and lives in the woods or on elevated soils, is very fond of warmth and sunshine, and feeds both on the roots of herbs, fruits, insects, and worms, and also on snails, the shell of which it easily breaks with its strong jaws. It is often kept in gardens, as it does no mischief, but destroys noxious insects. In October, they bury themselves as deep as two feet under ground, become torpid, and do not appear again till April. They are long-lived. This species inhabits the islands and the countries bordering on the Mediterranean, and it is the most common in Europe. Their eggs are eaten as food, and the young ones also by the Greeks, who consider them as much lenten fare as fish. It is this species which was placed by the Grecian sculptor Phidias at the feet of his Venus, as an emblem of gentleness.

EMYS—*Marsh Tortoise*. A most extensive family, numbering seventy-four species, according to M. Bibron. Their general characteristics are those of the genus *Testudo*; their shell is, however, flatter, their toes are more widely separated, and they are webbed, and armed with long sharp nails. They tenant swamps, lakes, ponds, and small rivers, and owing to the structure of their feet, they swim with considerable facility. They are also active on land, but they do not venture far from the water. They are carnivorous, preying on insects, frogs, newts, and even fishes. Some of the species (*e. g.*, the *Alligator Tortoise*) are large and ferocious, and dangerous even to man.

STERNOTHERUS. The illustrated species, the *Three-striped Tortoise*, (*Terrapene Trifasciatus*) has a long, narrow head, somewhat depressed, with a lengthy beak; from each nostril passes across the orbit to the back of the head, where they join, a deep brown band; neck long, ashy above and yellow beneath; dorsal plate oval, broader behind, its margin slightly indented, and the dorsal ridge carinated; its horny plates very thin, slightly wrinkled, and striated on their edge; marginal plates twenty-five; hind part of the breast-plate notched, and so close to the back-plate as to render the posterior aperture for the thighs very narrow; tail long and slender; general colour of the back-plate light dull yellow, intermixed with red and black markings; breast-plate black, with a light edge and centre. There are three other species.

CHELONIA. The species are the *Edible*, or *Green Turtle* (*T. Midas*); the *Imbricated Turtle*, and the *Hawk-billed Turtle* (*T. Caretta*); also *C. Maculosa* and *C. Lachrymata*, nearly connected with the Edible Turtle, and the *C. Radiata* and *C. Virgata* (Plate 1), closely allied to the Imbricated species.

The *Striped Turtle* (*C. Virgata*) has raised scales, with pointed lateral angles, and radiating black lines.

All the individuals composing this genus are covered with scales, more or less varied in colour and number, according to the different species; their feet are flat and webbed, and are thus adapted to serve the purpose of oars.

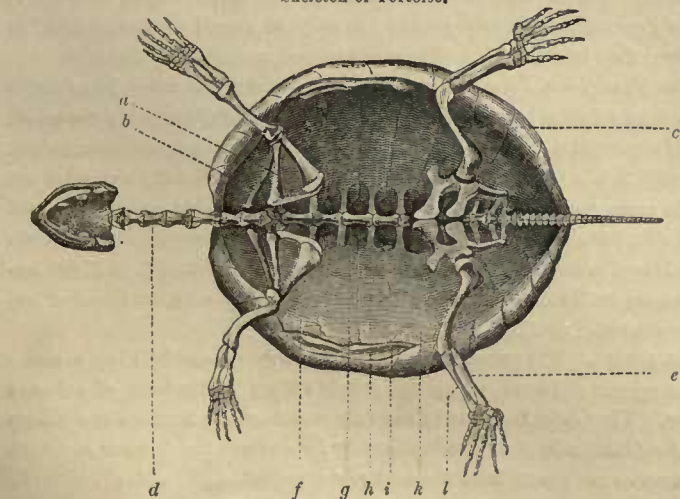
CHELYS. This genus is distinguished from the Emydes by the characters given above, and by the absence of the horny beak which characterise the Testudina.

The *Matamata* (Plate 1) is a native of Cayenne; where it frequents lakes and rivers, preying upon water-fowl, fishes, and insects. Its flesh is eaten by the natives as a delicacy. The carapace is depressed, with a keel down the centre, and a furrow on each side of it; the snout is flexible, forming a double tube; a horny lamina defends the jaws; two rows of cutaneous fringes run along the back of the neck; an ear-like membranous prolongation extends forward on the sides of the head; four membranous fringes hang from the throat, and two from the chin. The length of the full-grown animal is about three feet.

TRIONYX. The genera *Trionyx* and *Chelonia* are those alone of the Chelonian order which have the ribs, although consolidated in the back-plate, distinctly visible by their elevation on the inside of the shell, and by their free projection beyond it; they are distinguished, however, by the absence in *Trionyx* of the bony belt which forms the disc of *Chelonia*; hence the skin, which extends some distance beyond the points of the ribs, is flexible, and capable of being acted on by muscular radiations which pass into it, for which purpose it is not covered with scales, but the whole surface is enveloped in an epidermal tissue, which does not offer such opposition to motion as scales would. By raising or depressing, either separately or together, these loose folds of extended skin, the animal is enabled to swim with great swiftness, and in a very peculiar manner, rolling itself over and over, so that, when moving upon the surface of the water, its back and belly are alternately seen. They prey on fish, frogs, and even young aquatic birds.

The *Nilotic Trionyx*, or *Soft Tortoise* (the *T. Ægyptiacus* of Geoffroy), is three feet in length; back-plate somewhat convex, and rather prominent along the ridge of the spine; ribs occupying a fourth part of the space beyond the bony support; front of the soft part of the back-plate slightly festooned and not tubercular; the other part of the skin leathery, striated, and rough; its colour green, and spotted with white; breast-plate having its two anterior appendices very widely separated; it has also four callosities; legs short and webbed. It is found in the Nile, though not very common, where it is called *Tyrse*, and feeds upon the young crocodiles so soon as they have burst their shell.

Skeleton of Tortoise.



a, clavicle; b, scapula; c, femur; d, cervical vertebrae; e, fibula; f, caracoid bone; g, dorsal vertebrae; h, ribs; i, sternal ribs; k, pelvis; l, tibia.

ORDER II.—CHAMPSIA. CROCODILES.

THE Crocodiles had been included in the great genus *Lacerta*, till Cuvier separated and formed them into a distinct genus under the name *Crocodylus*, the characters of which are:—tail flat on the sides; hind feet entirely or partially webbed; tongue attached to the bottom of the mouth and not extensible; teeth numerous, pointed, and single; body covered above with strong hard scales, and below with soft broad scales; the eyes protected with three eyelids. Cuvier has also divided them into three subgenera, *Gavials*, *Crocodylus*, and *Alligators*.

Family—CROCODILE; *Crocodylia*.

ILLUSTRATIVE EXAMPLES.

PLATE 2.

Genera.	Species.	Common Name.
Ramphastoma - - -	Gangeticus - - -	Indian Gavial or Crocodile.
Crocodylus - - -	Vulgaris - - -	Nilotic Crocodile.
Champsia - - -	Sclerops - - -	Spectacle Alligator.

CHARACTERS OF THE GENERA.

1. **RAMPHASTOMA, or GAVIALS.** Snout slender, very long, and rather larger at the tip; teeth almost of equal size, the fourth lower tooth on each side received into a notch or groove in the upper jaw; the hind feet webbed to the tips of the toes, and notched on their outer edge; two small holes in the skull behind the eyes.

2. **CROCODYLES (Proper).** Head oblong and flattened; teeth unequal, the fourth on either side below received into notches, but not into holes in the upper jaw; in other respects like the *Gavials*.

3. **CHAMPSA—Alligator.** Snout broad and obtuse; teeth unequal, of which the fourth on either side in the lower jaw enters into a hole in the upper, but not a notch; the feet are only half-webbed, and not denticulated.

CHAMPSA.—DESCRIPTION OF THE SPECIES.

Crocodiles are both the largest and most powerful of the *Saurus* reptiles; their body is better protected with scales, and the skin of the back especially, is so well guarded by numerous horny shields as to resist a musket-ball: from it the negroes are in the habit of making helmets. The scales on the back form a middle longitudinal crest, extending through its whole length, and the tail has the crest deeply denticulated, and double at its root; the anterior extremities have five, and the posterior four toes, of which the three inner only are provided with nails or claws, but all are more or less webbed; the eyes are placed near each other on the top of the head and above the face, are very moveable, and protected by a nictitating membrane or haw, besides the eyelids; the tongue is short and thick, but cannot be protruded from the mouth, which led the ancients to imagine that it was wanting; the body itself is of a pyramidal form and tapering, covered above with four or six rows of square tubercular scales, and below with smooth, soft, transverse, broad, horny bands, or scuta. They lay from thirty to sixty eggs, at two or three different periods, which they bury in the sand, and leave to be hatched by the sun; to these the Ichneumon is a very great enemy, and the great increase of crocodiles is only kept down by the havoc which this animal makes amongst the eggs; and hence, perhaps, have originated the divine honours which were paid to it by the ancient Egyptians.

The *Indian Crocodile* (Plate 2) is a native of the Ganges, and probably of the neighbouring rivers, but is not considered to be dangerous to man, living only on fish. Its head is very broad behind; orbits very wide, and much separated from each other; the cranial holes large; twenty-five teeth on either side above, and twenty-eight below; length of snout about an eighth of that of the body; two little scales only behind the head, followed by four placed transversely, which are continued to those of the back.

The *Nilotic, or Common Crocodile* (*C. Vulgaris*), is the largest animal of the genus, measuring about thirty feet in length. It inhabits the Nile and Senegal, and probably the other rivers of Africa; but at present it is found

in the Nile, only in Upper Egypt, where the temperature is very high, and where the animal never becomes torpid: when it comes down in the streams which water the Delta, according to Pliny's account, it passes the four winter months in the caverns without nourishment. The head of this crocodile is about twice as long as its breadth; the holes in the skull are broader than their length; the snout irregular and rough; immediately behind the skull are four little crested scales placed transversely, and behind them, the neck-piece composed of six crested scales; next to them are two single scales, followed by sixteen transverse dorsal rows; besides these, on each side, is a row of seven or eight crested scales; the crested scales on the tail do not begin to be distinct till the sixth row, and then form two crests, which unite about the seventeenth or eighteenth row, which is the number of caudal rows always found. In consequence of the regularity of the scales, Cuvier says that the back of the Nilotic crocodile appears as if paved with quadrangular stones. The colour of the back is a greenish-bronze, speckled with brown; whilst that of the belly is of a greenish-yellow. The Crocodile lays, at three or four times, not far distant from each other, about twenty eggs, in size nearly resembling those of the Swan, which it buries in the sand, and having covered them, leaves them to be hatched by the heat of the sun.

The *Spectacle Alligator* (*C. Sclerops*) is the most common Alligator in Guiana and Brazil, and is remarkable for a bony crest between the orbits; on the back of the neck are four very strong transverse bands, which touch each other, and join the dorsal bands. The colour of this Alligator is greenish, brown above, and spotted with green, and pale yellowish-green beneath.

Alligators grow to a large size, sometimes to the length of fourteen feet; they are natives of South America, where they were called Caymans by the natives. They spend the greater part of night in the water; but during the daytime bask in the sun upon the sands, and generally run to the water when they see either man or dog; in the water they are not so timid; for, according to De la Borde's account, at Cayenne, they will often attempt to get into the boats which pass along the river. It is said that these animals form a kind of hillock on the bank of the river, in which they deposit their eggs, to the number of sixty, at two or three different periods.

ORDER III.—SAURIA. LIZARDS.

THE order Sauria includes a vast number of animals, varying in size from the large and predaceous *Monitor* (*Tupinambis*), down to the beautiful *Chameleon* of lands bordering on the Mediterranean, or the harmless little *Lizard* of our copses. Their form and habits are also varied. Most of them are distinguished by their Snake-like tongue—slender, extensible, forked; by their long body, and by their rapid gait; by their five toes, which are armed with claws, and by the scales under their belly being disposed in parallel transverse lines. They are bright-eyed and adorned with resplendent colours.

Family—LIZARD-LIKE; *Lacertidæ*.
ILLUSTRATIVE EXAMPLES.

PLATE 3.		
Genera.	Species.	Common Name.
Tupinambis	- - - Nilotica	- - - Nilotic Ouaran.
Lacerta	- - - Ocellata	- - - Eyed Lizard.

CHARACTERS OF THE GENERA.

1. TUPINAMBIS. Head oblong, pyramidal; teeth in both jaws; tongue forked, extensible; upper part of the body covered with very minute hexagonal or rounded scales, disposed in bands; belly covered with small square scales; tail as long as the body, thick, cylindrical at its base, tapering towards its tip; in some there are, and in others there are not femoral pores; hind legs longest and stoutest; all furnished with five distinct slender toes, having little curved claws.
2. LACERTA. Head oblong, pyramidal, covered with a few scales; palate armed with two rows of teeth; tongue forked, extensile; aural opening

oblong, deep; a collar of transverse broad scales, separated by other smaller ones from those of the belly, which are square and disposed in from six to ten rows; upper part of the body covered with numerous transverse rows of small scales; tail as long as the body, the scales disposed in rings, without either crest or keel above; hind feet longer than those in front, all five-toed, distinct, and armed with little claws, the little toe of the hind feet placed on the side a little below the others; under each thigh a row of little grains or scaly tubercles, which are porous.

Other Genera of this Family:—*Chalcides*, *Pygopus*, *Tachydromus*.

LACERTIDA.—DESCRIPTION OF THE SPECIES.

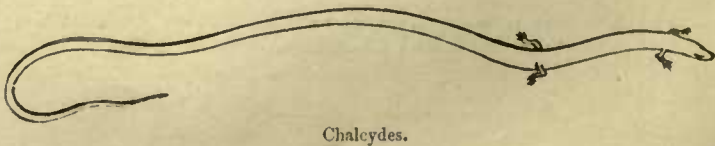
TUPINAMBIS. The species are numerous, and are divided into *Ouarans* and *Teyous*; the former of which have the head, limbs, belly, and tail covered with numerous small scales, which, ranged in a double row, form a sort of crest upon the tail, in some species very distinct, but in others scarcely visible; no femoral pores. In the latter, the head is covered with angular scales; the throat skin is disposed in a double fold and overspread with small scales; the belly and the tail furnished with large rectangular scales; and on each thigh is a row of pores.

The *Nilotic Ouaran* (Plate 3) measures from three to three and a half feet in length, of which the tail is one-half, according to Isidore St. Hilaire, but Cuvier states that it sometimes measures five or six feet from the muzzle to the tip of the tail. The upper part of the head is dusky, and the back seems marbled only with green and black, but on closer observation, the black is disposed in spots of various form, the greater number of which are merely simple black lines, surrounding a paler space, in the middle of which are found also some black scales; under part of the body greenish; sides of the tail indistinctly banded with black and green. This species lives on the banks of the Nile, and is often seen in the river itself. It is very predaceous, attacking all the little animals it can master with great avidity; and if irritated hisses loudly, and endeavours to bite or to strike with its tail.

LACERTA. The true Lizards are distributed very generally over the earth; they are lively, elegant little animals, running and skipping about with great agility, and climbing trees and perpendicular walls as easily as if running on a flat surface: in the warm weather they may be seen basking in the sun, but when it becomes cold they return to their holes, where they remain throughout the winter. They are monogamous, and exhibit great attachment to each other. They feed principally on insects, but the larger species occasionally rob birds' nests of their eggs, and even destroy the young. None of them are amphibious, a mode of life for which their cleft toes and rounded tail render them incompetent. Some persons have supposed Lizards to be poisonous; but the experiments of Laurenti, who exposed birds to the bite of the *Lacerta Viridis*, have proved this to be an absurd opinion; but when attacked they bite severely. There are several species.

The *Eyed Green Lizard* (Plate 3) is the largest of the genus, being rather more than a foot in length; the belly is of a spotless light yellow; the whole of the upper parts, the neck, and limbs are covered with zigzag lines, points, and circlets of a beautiful bright green on a black ground; the sides are bright green marked with eight or ten transverse double stripes; the tail brownish, but deeper at its root, and speckled with numerous green dots. This Lizard is found in all the southern countries of Europe, and not uncommonly in Switzerland and France, occasionally even in Sweden and Kamschatka.

CHALCIDES. The generic term *Chalcides* was employed by Pliny to designate a species of Lizard, which had certain stripes on the back of a brassy colour. The Chalcides seem to form a connecting link between the Sauria and the Ophidia by their much-lengthened body, and the distance at which the anterior are placed from the posterior extremities.



Pygopus. This genus is nearly allied to *Bipes*, from which it is distinguished by its members having only a single toe to each.

Tachydromus. This genus of reptiles is distinguished from all other of the Lizard family by having the body and tail verticillated. Their country is not known.

Family—IGUANAS; *Iguanida*.

The Iguanas bear a strong resemblance to the Lizards in their general conformation; their tail is long, their toes are few and unequal, and their eye and ear are also similar; but they have thick tongues, non-extensible, and notched only at the tip.

Genera.	Species.	Common Name.
Stellio - - - -	Vulgaris - - - -	Common Stellio.
Draco - - - -	Lineatus - - - -	Striped Dragon.
Iguana - - - -	Tuberculata - - - -	Common Guana.
Anolis - - - -	Capensis - - - -	Cape Anolis.

Other Genera of this Family:—*Basiliscus*, *Polychrus*, *Sitana*, *Trapelus*, *Tropidurus*, *Uromastix*.

CHARACTERS OF THE GENERA.

1. **STELLIO** (Lat. *stella*, a star). Head broad and depressed; mouth wide; jaws armed with a single row of very small close-set teeth, but none in the palate; tongue short, fleshy, and not extensible; eyes very large; eyelids short; body full, low on the limbs, the belly dependent and more bulky in the middle; no dorsal crest; tail varying in length; feet of moderate size, and toes of nearly equal length, sometimes expanded wholly or partially, sometimes webbed, their retractile nails contained each in a groove.

2. **DRACO** (Gr. *δράκων*, a Dragon). Body covered with small scales; two membranous wings; head rounded, muzzle rather obtuse; each jaw provided with four small incisive teeth, and one long pointed cuspid, and a dozen tricuspid molar teeth on each side; a pendulous inflatable skin under the throat, a smaller one on each side of the neck; tail long, thin, and flexible, covered obliquely with carinated scales, like the meshes of a net.

3. **IGUANA**. Head slightly resembling a cone with four faces; jaws furnished with numerous narrow, triangular teeth, two other rows on the back of the palate; tongue fleshy, broad, notched at its tip, extensible; under the throat the skin is pendulous; body and tail encircled with numerous rings, each composed of several small squarish scales, overlapping each other; along the ridge of the back and the tail a row of thin lancet-shaped spines; legs strong, toes five on each foot, deeply cleft, and tipped with strong hooked claws; a row of tubercular follicles on the thighs.

4. **ANOLIS**. General characters same as before, with this distinguishing peculiarity, that the skin of the toes widen under the antepenultimate phalanx into an oval disk.

For a general description of the "other Genera" see further on.

IGUANIDA.—DESCRIPTION OF THE SPECIES.

STELLIO. In the flatness and breadth of the head of these animals they have some resemblance to the family of *Crocodyles* among Saurous reptiles, but still more to the Tailed Batrachians, viz., the Tritons and Salamanders: the tongue is distinguished from that of the *Crocodyles* by its breadth and the slight cleft of its tip, which is free and capable of protrusion from the mouth, but it is not completely protractile as in the Skinks and Lizards, and more nearly in this respect resembles the family of the *Iguanas*. The eyes have only cutaneous folds supplying the place of eyelids, which are capable of retraction behind the ball of the eye, distinguishing them from all others of the Saurous reptiles; in many of them the pupil is vertical and linear in a strong light, just as is the pupil of the Cat.

The *Common Stellio* (*S. Vulgaris*) measures about a foot in length, and is spread over the whole of the Levantine countries; it is found concealed in crevices of old walls, ruins, and masses of mouldering stones. Its general colour is olive shaded with black, the under parts being yellow, or olive yellow. It feeds on insects of all kinds. The Mahometans persecute and

kill it with religious zeal, because of a curious motion of its head, which they superstitiously believe is in mockery of their bending down in their devotional exercises.

DRACO—Dragon. The three species composing this genus, the *Striped Dragon* (*D. Lineatus*), *D. Viridis*, and *D. Fuscus*, are remarkable for the pair of wings or membranous expansions attached to the sides of the body, which are produced by the six upper false ribs being extended laterally instead of encircling the body, and covered with membrane; they are moveable like a fan, upwards and downwards, at the will of the animal, but when at rest they remain in the horizontal position. They are found in the hottest regions of Africa and India.



The Dragon.

IGUANA. The Guanas are natives of the Torrid Zone, and vegetable feeders; they are not poisonous, but bite hard, and will not quit their hold till they have bitten away the piece they have caught in their teeth. Five species are enumerated.



The Iguana.

The illustrated species (Plate 3) is the *Common Guana* (*I. Tuberculata*), a native of Brazil, Cayenne, the Antilles, and the Bahamas; it grows to a considerable size, sometimes measuring six feet in length, including the tail. Its flesh is eaten and esteemed by many as a luxury, it being delicate and easy of digestion; indeed it formed at one time a great part of the subsistence of the inhabitants of the Bahama Islands. They feed on vegetables and fruit, and on a particular fungus which grows at the roots of some trees. Their general colour is dark green, tinged with olive, and occasionally with blue; the tail is mixed alternately with brown and green, and the sides of the neck are covered with tubercles.

ANOLIS. This is an American genus, of which there are, according to Bibron, twenty-five distinct species. They are insectivorous, but sometimes satiate their hunger with berries; they are very timid, restless, and curious, fond of music, of which boys take advantage in order to catch them, which they do by throwing a loop over their head, having first arrested their attention with musical sounds. They frequent woods and rocky places, running or leaping with much agility; they are small and of slender make: their toes furnished with hooked claws assist them in climbing the branches of trees, or in making their way over stones. The skin of the throat forms a pendulous dewlap, capable of being inflated, which is always the case when the animal is excited through fear or anger. In one species, the *Anolis Bullaris*, the dewlap when dilated is of a bright cherry red.

Cape Anolis (*A. Capensis*) is figured on Plate 3.

Cuvier has subdivided them into, 1. Broad-fingered; 2. Half-fingered; 3. Furrowed-fingered; 4. Fan-fingered; and 5. Broad-tailed Geckos. See *Gecko*.

BASILISCUS. This genus consists of two species, the *Basilisk* (*B. Cucullatus*), and the *Ambonia Basilisk* (*B. Amboinensis*). They have a sharp scaly crest or fin supported by the vertebral spines, and extending more or less along the back and tail, and attached probably to the spinous processes of the vertebrae, and which is capable of being elevated or depressed at pleasure.

POLYCHRUS. This genus is intermediate between the *Agamas* and *Geckos*. Like the Chameleon it has the power of changing the colour of its skin, probably depending, as in that animal, on the great size of its lungs, which extend throughout nearly the whole length of the body.

SITAXA. General colour tawny, marked along the back with a row of large, rhomboidal, brown patches. It is distinguished from the genus *Draco*, to which it is nearly allied, by a large kind of dewlap which extends from the throat nearly to the middle of the belly, and is twice as deep as the animal's height; its false ribs also do not project laterally to support the skin and form the so-called wings of the Dragon.

TRAPELUS. General form and teeth similar to those of *Agama*; scales smooth, not spiny, and extremely small. They have been separated by Cuvier from the *Agama* on account of the minuteness and smoothness of their scales, and of the teeth resembling those of the *Stelliones*, to which they are more nearly allied.

TROPIDURUS. The animal which forms this genus (*T. Torquatus*) is distinguished from the Levant Stellion by the absence of the throat-sac, and by the scuta which cover the top of the head. It is one of the most common Lizards in the eastern part of Brazil, and lives in dry, sandy, or stony districts, where it is called by the general name *Lagarta*, or Lizard.

UROMATRIX. This genus, often called *Bastard Stellions*, is distinguished from the *Stellions* by the flatness of its head, by the smoothness of its scales, and by the pores on its thighs. The four teeth in the intermaxillary bone of the young animal become subsequently consolidated into a single one. The scales on the trunk are generally small, rhomboidal, smooth, equal sized, and slightly imbricated, but occasionally there are found little granular scales, intermingled with others of larger size. The toes are large, short, cylindrical, covered above with one row, and on the sides with two rows of rhomboidal scales, the first four toes of each foot graduated. The scales covering the tail are quadrilateral, and of these the upper are almost all surmounted with a triangular spine on one of their hind corners. They are natives of Africa.

ILLUSTRATIVE EXAMPLES.

PLATE 4.

Family—GECKOS; *Geckotida*.

The Geckos are nocturnal in their habits, hence they are furnished with large eyes, the pupils of which, like those of Cat's eyes, shrink from the light; they have not the attenuated form of Lizards; their gait is slow and stately, their feet being of mean length; their skin is granulated with minute scales, and their tail has circular folds.

Genus.	Species.	Common Name.
Gecko	- - - - <i>Ægyptiacus</i>	- - - Egyptian Gecko.

Family—CHAMELEONS; *Chamæleonida*.

The family *Chamæleonida* is one of the most remarkable among animals; the sympathy of the two sides of their entire system is of so diminished a character that one side may be of one colour and the other of another; or one side may be asleep and the other side awake at the same time; while their eyes, which are large and nearly covered with the skin, act independently of one another. The vastness of their lung is such that when inflated with air, the animal is rendered transparent.

Chamæleo	- - -	<i>Vulgaris</i>	- - -	Common Chameleon.
----------	-------	-----------------	-------	-------------------

Family—SCINKS; *Scincoida*.

The Scink family are distinguished by their tongue, which is non-extensible; by the equality of the scales which overspread their body and tail, and by the shortness of their feet.

Scincus	- - - -	<i>Officinalis</i>	- - - -	Official Scink.
Seps	- - - -	<i>Tridactylus</i>	- - - -	Three-toed.
Bipes	- - - -	<i>Lepidopus</i>	- - - -	Scaly-footed Biped.
Chirotes	- - - -	<i>Propus</i>	- - - -	

CHARACTERS OF THE GENERA.

1. **GECKO.** Same as *STELLIO* above; but besides their distinct toes, which are always furnished with two or more nails, they have not any fringe on the sides of the body, tail, or limbs.

1. **CHAMELEO** (Gr. *χαμαιλέον*). Skin capable of change of colour, studded with scaly grains; body compressed; tail round and prehensile; head irregularly rhomboidal, presenting eight faces; tongue long, vermiform, and much expanded at the tip; teeth trilobed; eyes large, covered with skin, which is pierced by a small hole in the centre opposite the pupil, and moveable independent of each other; ear hardly visible; feet pentadactylous, two of the toes joined together by a membrane extending as far as the claws, and the other three united in like manner apart, so as to form two distinct sets of toes on the same foot.

1. **SCINCUS** (Gr. *σκήκος*, *Skink*). Body elongated, spindle-shaped, cylindrical, covered with imbricated scales; head oblong; jaws armed with small close-set teeth; the tongue fleshy, and slightly forked at the tip; tympanum more or less distinct, its anterior edge sometimes furnished with a toothlike process; tail short or very long, cylindrical, and generally covered with imbricated scales—in some species, however, it has transverse plates on its under surface; legs short and slender, having five distinct toes of equal or nearly equal length, and terminated with short nails.

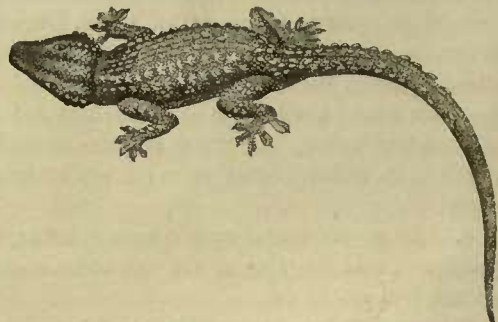
2. **SEPS** (Gr. *σήπω*, *I putrefy*). Head small, obtuse, covered with scuta; tympanal membrane distinct, and behind the maxillary joint; tongue thick, short, and cleft at tip; neck, body, and tail long, slender, and cylindrical, covered with round imbricated scales; front and hind limbs far apart, slender and short, and terminating each in one, three, four, or five very small toes; viviparous.

3. **BIPES.** Hind feet only visible; ears very distinct.

4. **CHIROTES** (Gr. *χείρ*, *a hand*). Two small feet before, none behind.

GECKOTIDA, CHAMÆLEONIDA, SCINCOTIDA.—DESCRIPTION OF THE SPECIES.

GECKO. This genus is said to derive its name, Gecko, from a peculiar cry made by one of its species which inhabits Batavia, according to Bontius; it is of a thicker form than the other lizards; the feet are very remarkable, from the under part of the toes being covered with such fine folds of skin, as to enable them to walk on the ceiling; their nails, which are wanting in some species, are retractile in different ways,



Gecko.

for the purpose of preserving their points, and to give them a better grasp: the pupil of the eye contracts very much in the light, like those nocturnal animals who pass the day in their holes. They are a very numerous genus, and scattered over the warm countries of both continents. They have been accused of being poisonous, in consequence of their dull air and partial resemblance to the salamanders and toads; but the charge is without foundation.

The illustrated species, the *Egyptian Gecko*, is about eighteen inches and a quarter in length, and is distinguished from the Wall Gecko by the anterior edge of the external auditory passage being more distinctly toothed, by the tubercles on the upper part of the body being smooth, conical, and further apart, whilst those on the sides of the body and limbs are rather small, and distributed in four longitudinal rows; it is marked between the two shoulders with four white spots disposed in a square, and widely but irregularly surrounded with black; sometimes the front two approach so closely as to unite. It is a native of Egypt.

CHAMÆLEO. The *Chamæleon* was known to the ancients, and celebrated for its Protean colours and the power of living upon air, which they believed it possessed, as we find in Ovid—

“Id quoque quod ventis animal nutritur et aurā,
Protinus assimilat tetigit quoscunque colores.”

Its power of living on air is, of course, fabulous; and it may be often seen catching flies, by darting out its long tongue, which is expanded at the tip, and covered with a strong glutinous secretion for that purpose; the mechanism by which the tongue is thrown out is similar to that which belongs to the tongue of the Woodpecker.



The Chamæleon.

It does not assume the colour of any substance near which it may be placed, as supposed by the older naturalists; but its change of colour, which is very frequent, has given rise to a notion, that it has no proper colour of its own; this, however, is not the case, as will be seen by examining the different species, each of which has its peculiar colour, to which it returns in a short time after the accidental changes to which it is subject.

The animal has the power of inflating considerably every part of the body, even the paws and tail so as to double its size; this is done by gentle irregular efforts, and when completely filled with air it will remain so for a couple of hours; after which it returns to its natural size, though much more slowly than it dilated.

It cannot run, but moves very slowly, resting a short time after every step, as if to be sure its footing were firm.

It is a very harmless gentle animal, living among the branches of trees, where it lies in ambuscade, to catch the unwary insects which may happen to come within its reach. In the winter it hides itself in the clefts of rocks, under stones, &c., and becomes torpid. It lays from nine to twelve eggs of an oval shape, covered with a thin membrane, similar to that which covers the eggs of the Sea Turtles and the Iguana. This genus is found in its native state only in Asia and Africa.

The *Common Chamæleon* (*C. Vulgaris*) is about eighteen inches long, of which the tail occupies half the length; its general colour is an ashy brown. A native of Egypt and Barbary; and, according to Cuvier, of Spain also.

SCINCUS—Skink. This genus is easily distinguished from most others of the Saurian reptiles by the elliptical or roundish scales, which are imbricated like those of the Carp, except on the tails of a few species, and entirely cover the body. Like the Lizards their head is covered with scaly plates, and some have a row of pores upon the thighs. The head and neck run so completely into each other that it is not possible to distinguish them. The body varies in form in different species; in some it is spindle-shaped, and in others regularly cylindrical, more or less lengthened, so as to resemble the Serpent family, and especially the Blind-worms, *Anguis*, with which their internal structure possesses many similar characteristics. The tail varies considerably, sometimes it is short, thick, and conical, at other times very long, tapering, and extremely slender towards the tip. They are found in the warmer climates of both the old and new world, inhabiting dry and rocky places, fond of basking in the sun, and pursuing the small insects, on which they feed with great avidity, especially those species which have very long tails. They have lain, at least some of them, under the imputation of being venomous; but as no authenticated instance has yet been adduced of any injury having been sustained from them, it is not very improper to consider this as a vulgar prejudice.

The species are divided into two classes: 1. True Skinks, having two rows of palatine teeth, and a toothlike process on the anterior edge of the tympanum; 2. Skinks, without palatine teeth (the *Tiliqua* of Gray).

The *Officinal Skink* (Plate 4) belongs to the True Skinks: it is about six or eight inches in length, of which not quite a third belongs to the tail. The general colour is more or less deep ferruginous, marked with transverse brown bands on the back, but becoming whitish on the under part of the body; after death the colour fades, and the animal then assumes the yellowish-white or silvery appearance it possesses when brought to Europe. It is found in Nubia, Abyssinia, Egypt, and Arabia, and is known to the Arabs by the name *El Adda*.

SEPS. This genus is very similar to the Skinks, but distinguished by the long slender form of the body, in which, as well in some other respects, it resembles the Blind-worms, *Anguis*, but separated from them by the existence of limbs, and by the tympanal membrane being visible. The variation in the number of the toes is very remarkable.

The species *Three-toed Seps* (*S. Tridactylus*) varies in size according to the country in which it is found: in France it does not exceed five or six inches, but in Sardinia is more than twelve; its colour is muddy or ashy above, with two longitudinal coppery bands on either side; the belly is paler. It dreads the cold; and at the approach of winter, in Sardinia, buries itself about October, and does not reappear till spring. It is an old and vulgar error that this animal is venomous, hence the name *Seps*, which was indiscriminately applied by the ancients to this genus and to *Chalcides*.

BIPES—Biped. This genus resembles generally a snake, but on closer inspection two small moveable appendages are found, one on either side of the vent, in which Cuvier discovered on dissection an os femoris, fibula, and fibula, with four metatarsal bones forming fingers, which, however, have no phalanges.

The *Scaly-footed Biped* (*B. Lepidopus*) has a tail twice as long as the body; it has two lines of pores near the vent; and its feet have the appearance of two small oblong scaly plates.

CHIROTES. This genus very much resembles the genera *Amphisbæna* and *Chalcides*, in having the body covered with circular rows of quadrangular scales; but it differs from the former in having feet, and from the latter in only having the feet before.

The only species is the *C. Mexicanus* (*C. Propus* of Plate 4), it is completely provided with a brachial apparatus; it is about eight inches long, as thick as the little finger, flesh-coloured, and marked with more than two hundred demi-rings on the back, and as many on the belly, which meet alternately on the sides; tongue but little projective, terminating in two horny points; tympanum covered with skin. Native of Mexico, and feeds on insects.

ORDER IV.—OPHIDIA. SERPENTS.

Of all Reptiles the Serpent family most deserve the name: they are destitute of feet, are of great length, and they move only by means of folds in their elongated body, which they press backward against the ground. From the well-known venomous qualities of some of the families of this Order, a prejudice has arisen, and still exists, against all the families composing it; hence they are all viewed with feelings of horror and aversion.

ILLUSTRATIVE EXAMPLES.

PLATE 5.

Family—ANGUIFORMIA.

The family Anguida, or Anguiformia, are characterised externally by imbricated scales, which cover them entirely; they have a bony head; their teeth and tongue resemble the Seps, and they have three eyelids. They are, as Cuvier observes, Seps-lizards without feet.

Genus.	Species.
<i>Pseudopus</i> - - - - -	<i>Pallasii</i> .

Family—SNAKES.

Snakes have neither sternum nor any vestige of shoulder; nor have they a third eyelid nor a tympanum. The vertebræ are, however, articulated by a convex surface received into a concavity of the adjoining bone; and the ribs encircle a great part of the trunk.

<i>Amphisbæna</i> - - - - -	<i>Alba</i> .
<i>Tortrix</i> - - - - -	<i>Seytale</i> .

Family—SERPENTS, or Unpoisonous True Snakes.

Genera.	Species.	Common Name.
Boa - - - - -	Constrictor.	
Python - - - - -	Poda.	
Acrochordus - - - - -	Javanensis - - - - -	Java Oularcaron.

Other Genera of these Families:—Coluber, Ophisaurus, Typhlops.

CHARACTERS OF THE GENERA.

1. PSEUDOPUS. Tongue arrowhead-shaped, notched triangularly in front, with granulous papillæ on the smaller portion, and filiform papillæ on the larger portion of it; teeth on the palate; intermaxillary teeth conical and simple, maxillary teeth subcylindrical and subtubercular; plates on the head; nostrils lateral; neck destitute of a fold.

1. AMPHISBÆNA (Gr. ἀμφις, both ways, and βαίνω, to go). Head blunt, of uniform thickness with the body; eyes extremely small; muzzle like an arched beak, covered with plates; tongue broad, notched at the apex, and covered with papillæ; teeth simple, conical, and recurved; nostrils small and lateral.

2. TORTRIX (Lat. torqueo, I twist). Scales hexagonal, rather larger on the belly; mouth small, jaws not dilatable; no poison fangs; tail short.

1. BOA (Gr. βούς, an ox). Under part of the body and tail covered with rows of transverse scales or scuta, containing not more than one in each row; head covered with large flat scales; no poison fangs; tail cylindrical and not provided with a rattle.

2. PYTHON (so named from the great Serpent slain by Apollo). Head covered with small scales, except between and before the eyes, where they are much larger; in the lips two deep pits; body long and cylindrical; abdominal scuta single; subcaudal scuta arranged in pairs; sides of the body and tail edged with two longitudinal rows of scales; vent transverse and surrounded with a double row of small scales, on each side a spur.

3. ACROCORDUS (Gr. ἀκροχορδών, a wart). Head flat, covered with small scales; teeth small and sharp, a double row in each jaw; no poison-fangs; tongue short and thick; mouth contracted; under jaw shorter and broader than the upper.

ANGUIFORMIA, SNAKES, SERPENTS.—DESCRIPTION OF THE SPECIES.

PSEUDOPUS. The only species known is that figured on Plate 5, namely, the *Pseudopus Pallasii*. Prince Lucien Buonaparte describes the head and anterior part of the neck as being of a greyish-ash colour; the ground colour of the upper part of the body chestnut, verging to redness; the sides an ashy hue; while the scales are dotted with a great number of blackish points. The posterior limbs of this animal are reduced to the merest rudiments, being represented by two small scaly appendages. The scales of the body are square, thick, and semi-imbricated, and they become osseous with age. They are found in the Crimea, in Istria, the Morea, and the whole of the southern continent of Europe.

AMPHISBÆNA. This genus is so called from the facility with which the several species can crawl tail foremost as well as in the forward direction; hence the natives of Surinam, Cayenne, &c., imagine that they have two heads. They are, in general, dull and inanimate animals, and being awkward in their movements, their appearance is rendered very unattractive. They are perfectly harmless, and if handled will merely twist their bodies, and open their mouths, but make no attempt to bite. They bore into the soft earth and feed on termites, ants, and insects. There are ten species, one of which, the *White Amphisbæna* (A. Alba), is figured on Plate 5.

TORTRIX. This genus was separated from *Anguis*, Lin. by Oppel, on account of the scales beneath the body and tail being larger than on the other parts, and from the shortness of the tail. There are three or four species, all natives of America.

The *Tortrix Scytale*, Plate 5, measures from two to two and a half feet in length; ground colour white tinged with yellow, and encircled with about sixty bands, black and broken. It is principally found in Cayenne and Surinam, where, although harmless, it is much dreaded from its resemblance to the *Elaps Lemniscata*. It feeds on worms, caterpillars, and flies.

BOA. The name given to this genus is derived either in consequence of their great size, or from a fable of Pliny, who says, "that they attach themselves to the teats of cows, for the purpose of sucking their milk:" this latter notion, however, is so ridiculous as to require no further comment. The genus formerly included all serpents, venomous or not, the under part of whose body and tail were furnished with single transverse scales, and not possessed of anal claws, nor rattles on the tip of the tail; but they are now much reduced in number by the venomous serpents being excluded. They are found principally in the Indies, living in marshy places. They watch for their prey by the banks of rivers, and seizing it with their mouth, throw around it several coils of their body and squeeze it to death. When the animal is quite dead, the Boa unwreathes itself and prepares to gorge it, by first smearing it over with saliva, and then insinuating its jaws over it, till by degrees it is entirely swallowed.

Cuvier has divided the genus into three subgenera, the *Boas* properly so called, the *Eryx* and the *Erpeton*.

The *Boa Constrictor*, Plate 5, is one of the largest animals of the genus, being occasionally found of twenty-five or thirty feet in length; it is recognised by a long chain of large black spots, irregularly hexagonal, upon a yellowish-grey or grey ground, extending along the back, and having on either side numerous triangular spots with their points downwards; the head marked above with a large longitudinal band, and a smaller lateral one crossing the eyes towards the neck. It inhabits India, Africa, and South America.

PYTHON. This genus was separated from the *Boæ* by Daudin on account of the collar of scales surrounding the vent, and of the subcaudal scuta being mostly or entirely in pairs instead of single. Cuvier thinks that some of them acquire as great size as any of the *Boæ*. All of them are natives of India.

The figured species, Plate 5, the *Python Poda* of Bengal, is about two feet nine inches in length. The upper part of the head is flesh-coloured, as is also an oblique streak on each side of the neck; muzzle ashy; on the occiput a brown mark, divided by a flesh-coloured stripe; body and tail ashy, marked with about thirty large, broad, brown spots, edged with black, of various form and size; sides similarly spotted, but each spot having a white dot in the middle; under part of the tail varied with white and black. It possesses great power in its body and tail; and, Russell mentions, would grasp the arm of the person who held it by the neck so firmly as to numb it.

ACROCHORDUS. A genus which derives its name from a remarkable warty appearance of the skin, caused by the arrangement of the scales separate from one another, and marked each with three ridges: these when inflated give the appearance indicated by the generic name. The species, *A. Javanensis* (Plate 5), has been described by Lacepède, Lescherhault, and others: its average length is from six to ten feet; its form is peculiar, the body being gradually enlarged from the neck to the base of the tail, which is both short and slender. Its throat is capable of enormous dilatation. It has no poison-fangs. The general colour of the animal is black above, greyish-white beneath and on the sides, which are spotted with black. According to Hornstedt this animal subsists altogether on fruits, which if true is contrary to the habits of all other known species. Cuvier, however, doubts the assertion.

COLUBER. These, according to Cuvier's arrangement, include all those Snakes which have the scales on the under part of the tail arranged in pairs, at whatever part of the tail they may be found, either throughout its whole length, at its base, or at its tip; they are none of them venomous.

OPHISAURUS. This, as well as the genus *Anguis*, forms the link connecting the two orders *Ophidia* and *Sauria*; like the latter order they possess eyelids which the Snakes have not, and indeed seem to be little different from the genus *Seps*, except in being deprived of feet. They are found only in the New World, and are remarkable for the extreme fragility of their tail; they prefer the retired and swampy parts of extensive woods, and feed on insects, worms, and other small animals.

TYPHLOPS. This genus has great resemblance in the disposition of its scales to the Blind Worms, *Angues*. Their general form is very similar to Earth Worms; they live in the ground, and feed on ants and termites, which is perhaps the reason of their eyes being protected with so thick skin.

POISONOUS SNAKES.

The Venomous Serpents are divided into two sections, viz., those having poisonous isolated fangs, and those with fangs accompanied by several maxillary teeth. The latter have a close resemblance in the construction of their jaws to those of the Unpoisonous Snakes, their upper jaw-bone being large, long, and furnished with a row of strong curved teeth; while in the former the jaw-bone is short, thick, and armed with one or two very large curved hollow teeth. In the most deadly venom-snakes the poison-fangs acquire a large size, and are more strongly curved backwards than the ordinary teeth.

ILLUSTRATIVE EXAMPLES.

PLATE 6.

Family—FANGED POISONOUS SNAKES.

Genera.	Species.	Common Name.
Crotalus	- - - - Horridus	- - - - Banded Rattle-snake.
Vipera	- - - - Berus.	
Cerastes	- - - - Hasselquistii.	
Naja	- - - - Lutescens	- - - - Yellowish-hooded Snake.
Trimeresurus	- - - - Microcephalus.	

Family—FANGLESS POISONOUS SNAKES.

Pelamis vel Pelamides	- - Bicolor	- - - Bicoloured Sea Serpent.
Pseudo-boa seu Bongarus	- Fasciatus.	

Family—NAKED SNAKES; *Nudæ*.

This family is composed of but one genus, the *Cæcilians*; whose smooth and viscid skin appearing naked, has suggested the title by which they are designated.

Cæcilia - - - - *Glutinosa*.

Other Genera of these Families:—*Hydrophis*, *Trigonocephalus*.

CHARACTERS OF THE GENERA.

1. **CROTALUS** (Gr. *κρόταλον*, a rattle). Single transverse scaly plates along the belly and tail; extremity of latter furnished with a rattle, composed of numerous rings of horn received within, and moveable upon each other; poison-fangs on each side of the upper jaw.

2. **VIPERA** (Gr. *ἵππω*, I hurt). Head depressed, vertex in some covered with scuta, in others scaly; no depression before the eyes; body scaly above; abdominal scuta single, subcaudal in pairs; solid teeth in the palatine and inferior maxillary bones; in the superior maxillary, poison-teeth only.

3. **CERASTES**. Nearly the same as *Vipera*.

4. **NAJA** (from the Indian word *Nagou*, a poisonous Snake). Poison-fangs in the upper jaws, enclosed in a doubling of the gums, when at rest; mouth extensible; nose truncated, back of the head wide; head covered with large scales; neck opposite the space included between the sixth and twelfth abdominal scales dilatible into a kind of hood supported by the ribs; beneath the tail a double row of scales.

5. **TRIMERESURUS** (Gr. *τριμέρης*, divided into three parts, and *οὐρά*, a tail). Upper jaw furnished with poison-fangs; abdominal scuta entire; caudal scuta near the vent in pairs, towards the middle the same but larger, and near the tip smaller pairs.

1. **PELAMIS** (Gr. *πηλός*, mud). Body long, slightly cylindrical, and terminating in a flattened, obtuse tail; body, head, and tail covered with small scales; tongue short and thick; vent single and without hooks.

2. **PSEUDOB OA** (Gr. *ψευδής*, spurious, and *Boa*, a kind of Snake). Body covered with hexagonal scales; ventral and caudal plates simple; poison-fangs short and prominent, when the mouth is closed received into cavities in the lower jaw.

1. **CÆCILIA** (Lat. *cæcus*, blind). Body long and cylindrical, covered with a finely-granulated skin; head depressed; eyes very small; teeth small, pointed, and numerous; no poison-fangs.

FANGED, FANGLESS, AND NAKED SNAKES.—DESCRIPTION OF THE SPECIES.

CROTALUS—*Rattle Snake*. Of this venomous genus fortunately there are but few species, and these are all provided with a kind of rattle, whence they derive their name, the noise of which gives warning of their proximity to those who may accidentally come within their haunts. The body of the Rattle Snake is of a lengthened cylindrical form, diminishing in size towards the tail, and covered above with numerous carinated scales, whilst the belly is defended with narrow, single, transverse scales, extending from below the neck to the tip of the tail. The head is large and flat, of a triangular shape, and covered from between the edges with scales similar to those on the back, whilst those on the muzzle and those which cover the eyes are larger, and in the form of plates: the mouth is wide, and the upper lip pierced by a little groove behind each nostril; in the upper jaw on each side is placed the poison-fang, which is curved and sharp, about an inch in length, with a hole about the eighth of an inch from its point, through which the poison is ejected; the poison-fangs are contained in a sheath, and thrown out with considerable violence at the pleasure of the Snake. The poison of the Rattle Snake is very virulent, particularly if the Snake be in health.

An account has been given, by an American writer, of a farmer, who, whilst mowing, accidentally trod upon a Rattle Snake, which bit him through his boot, and he died very soon after. A few days subsequently one of his sons put on the same boots, was seized with the same symptoms on pulling them off in the evening, and died on the following day. His effects were disposed of by sale, and a neighbour bought the boots; after wearing them he also was attacked with the same symptoms, but under medical treatment recovered. In consequence of this, it was thought right to examine the boots carefully, and in one of them was found the fangs of the Snake with the poison-bags still adhering to them, and it appeared that these three persons had scratched themselves in pulling off the boots. Catesby states that the danger more materially depends on the severity of the bite than on any other cause; that he has known persons bitten survive many hours, but where the fang had pierced an artery or vein, inevitable death ensued in less than two minutes.

The power of fascination ascribed to the Rattle Snake is now much questioned; the opinion of Dr. Barton, of Philadelphia, that the story of fascination has arisen from the fears and cries of birds and other animals, in protection of their nests and young, being pretty generally adopted.

Rattle Snakes are viviparous; they are affected by music; are eaten by the Indians, who watch them when asleep, and then pinning down their neck with a forked stick, irritate them to bite a piece of leather, which they forcibly pull from them till they have jerked out the poison-bags, and having done that, they skin the animals, and cook them as we do Eels. They are all natives of America, and have been subdivided into two subgenera, from the head being covered either with scales, like those on the back, or with scuta or broad plates.

Plate 6 contains an illustration of the *Banded Rattle Snake* (*C. Horridus*), a member of the first division. It measures from five to six feet in length; general colour greyish, with a number of black lozenge-shaped spots, edged with yellowish-white on the back; tip of the tail black; belly yellowish-white and not spotted; rings of the rattle from one to thirteen.

VIPERA—*Viper*. These animals are all oviparous; and it is presumed by Mr. Bell, that the membrane of the egg is broken in the act of parturition, for he observes, "I have examined several in which the young have appeared ready to be excluded, and have always found the investing membrane entire, although so thin and soft as to be torn by the slightest force." They are all poisonous, and some more highly so than other. In this country we fortunately possess only one. During winter they retire to holes, and become torpid, but as warm weather returns, they revive, shed their coats, and during the heat of summer are very active, and most dangerous.

The *Common Viper* (*V. Berus*), figured on Plate 6, measures from eighteen inches to two feet in length, of which the tail is less than one-ninth. Its colours vary considerably, so that several species have been described, which have proved to be merely varieties of the one under consideration. The

ground colour of the back and upper parts is sometimes dirty yellow, at other times olive or pale ashy brown; and Bell observes, that after the skin has been recently cast, the surface is sometimes iridescent. The varieties are—the *Red Viper*, *Black Viper*, and *Plumber Viper*.

The Viper is found pretty generally throughout Europe, and is common in many parts of England, frequenting chalk-pits, dry sandy wastes, and thickets. It is said to be most numerous in the Western Isles, but in Ireland is unknown. The Black variety is most rare, and is noted as having been found only in Suffolk. During their hybernation, Vipers congregate together in some retired spot, and are found tied up as it were in a knotted coil. They feed on mice, frogs, and insects. The bite of this animal is much dreaded, and produces in the human subject generally more frightful than serious symptoms, though one instance is known in which a young man of 18 years of age died in St. Bartholomew's Hospital from this cause. The severity of the symptoms varies according to the time of year, upon which the virulence of the poison, or perhaps indeed its secretion, depends. The bite is of little consequence if perpetrated when the animal has been roused from its torpid state in winter. But, on the contrary, in the height of summer, when the Viper is in its greatest state of activity, the poison is correspondently strong.

CERASTES. The species figured on Plate 6 measures about two feet in length, of which the tail is five inches; the head obtuse, short, flattened, and widening behind the eyes; neck narrow; body spindle-shaped; above each eye is a little horn, slightly curved and vertical, about two lines in length, marked with four longitudinal grooves, and covered with a thin horny skin; lips edged with numerous small plates; scales on the head and trunk oval and carinated, those near the horns smaller than the others; abdominal scuta one hundred and fifty, caudal twenty-five pairs; irides yellowish-green; upper surface yellowish-grey, marked with irregular deep transverse spots; under parts yellowish-white. This species lives in holes in the sand in Egypt, in Syria, and Arabia, and throughout the East. It is very voracious, and often feeds till it becomes double its usual size. Bruce says the Jerboa often becomes its prey.

NAJA—Hooded Snake. These animals possess a remarkable power of expanding the neck into a kind of hood when irritated. This is effected by inflation of the lungs; and Dr. Russell says, that although the neck is thus remarkably spread out, the expansion is not merely confined to that part, but that it extends throughout the body, so that all the scales from the head to the tail are separated from each other, and the skin is seen between them. When disturbed they spring upright, raising themselves almost on the very extremity of the tail. They are highly venomous, and cause death very speedily after the infliction of their bite. The motions of these animals are performed by two or three undulations of the posterior third of the body, whilst the two anterior thirds are held erect, giving to the animal a very majestic appearance. At present there are but two distinct species known; one of them, however, includes several varieties.

The *Yellowish* or *Spectacle Hooded Snake* (*C. Lutescens*) measures four feet in length including the tail, which is about nine inches long; and the circumference of the body is about four inches; the membrane of the hood, when expanded, is about three inches wide, and upon it the scales are placed in longitudinal rows, slightly separated from each other. The general colour is yellowish or light brown, but in particular postures the scales assume a bluish-ashy tinge, and those of the belly are white with a reddish tinge: the colour of the skin beneath is white or pale orange. The most remarkable character, however, of this species is the spectacle-like mark on the back of the hood, consisting of two parallel black streaks, separated by an intermediate white badge, marking out the rings of a pair of spectacles, slightly separated from each other, black in the centres, and connected by a double arc, the convexity of which faces backwards, and in each leg of the arc is a small black spot. The form of the spectacles varies, and sometimes does not exist at all. When the animal is at rest, and the hood not expanded, these marks are not very striking; but when enraged, and the hood inflated, the scales become separated, and the spectacle figure, which is partly produced by the colour of the skin, becomes more distinct.

TRIMERESURUS. This genus is nearly allied to the Vipers: there are but two species, that figured on Plate 6 being the more important one:—

T. Microcephalus, from five to eight inches in length, of which the tail is one-eighth; scales smooth, excepting four or five longitudinal rows on the back, which have crests; tail very slender; colour uniform and dusky. A native of New Holland.

PELAMIS. The Pelamides have a near resemblance in their general form and habits to the Murenas, but possess neither gills nor fins, and their motions in the water are effected solely by the undulating movements of their tail, the flattened oar-like form of which is well adapted for sculling them along. They feed on Mollusca, and perhaps also on small fishes. The species are not numerous.

The *Bicoloured Sea Serpent* (Plate 6) is about two feet four inches in length; the head and body are black, with a longitudinal streak of sulphurous-yellow passing from the cheeks along either side to within two inches of the vent; under part of the head and belly greyish-green, and marked on the posterior half with little, rounded, black spots, whilst the whole tail is irregularly badged with black, white, and yellow. This animal is seen but rarely at Vizagapatam, where the fishermen wrongly consider it as venomous, as it has no poison-fangs.

PSEUDOBOA. The illustrated species (*P. Fasciata*) is about five feet and five inches in length; head small, scarcely broader than the neck, flat and obtuse; in the upper jaw on each side a short fang; in colour dark blue, streaked obliquely on each side with yellow to the throat, which is also yellow; neck, trunk, and tail surrounded with numerous broad bands alternately blue and yellow; tip of the tail round, blunt, and blue. A native of India. It is a very dangerous Snake, and its bite said to be inevitably mortal.

CECILIA. This genus of animals was first distinguished and described by Linnæus, and since his time has engaged the attention of other naturalists. The skin seems to consist of an epidermis which is very porous, and from which a quantity of viscid mucus is constantly flowing, and this becoming dry gives the appearance of detached old scales. The two species best known are natives of Guiana; they are the *C. Glutinosa* (Plate 6), and the *C. Tentaculata*; but very little is known of their habits.

HYDROPHIS (Gr. ὕδωρ, *water*, and ὄφις, *a serpent*). This group of animals are remarkable for their flat tail, which serves the purpose of an oar in sculling them through the water. Their poisonous fangs are very distinct.

TRIGONOCEPHALUS (Gr. τρίγωνον, *a triangle*, and κεφαλή, *a head*). This genus was included by Linnæus and others among his *Colubri*, but by Daudin, Latreille, and Dumeril among the *Viperæ*, but it has been formed into a distinct genus by Oppel. In most characters it agrees with the *Rattle Snakes* (*Crotali*), except in not having the tail furnished with a rattle; in its general habits and its poisonous properties it closely resembles them. Merrem prefers the generic title *Cophias* to this genus; and Prince Maximilian observes that the head is not triangular in all the species.

ORDER V.—BATRACHIA. FROGS.

THE Batrachians differ from the Tortoises, Lizards, and Serpents, in several important particulars; they either have no ribs, or but the rudiments of them; they are destitute of scales and carapace; and they are furnished with feet. These animals have two lungs; and the young have gills like fishes, which they lose on coming to maturity.

Family—TAILLESS; *Ecaudata*.

ILLUSTRATIVE EXAMPLES.

PLATE 7.			
Genera.	Species.	Common Name.	
Rana	- - - -	Eseulenta	- - - - Edible Frog.
Ceratophris	- - - -	Varius	- - - - Horned Frog.
Hyla	- - - -	Vulgaris	- - - - Tree Frog.
Bufo	- - - -	Vulgaris	- - - - Common Toad.
		Bombina	- - - - Yellow-bellied Toad.
Pipa	- - - -	Surinamensis	- - - - Surinam Pipa.

CHARACTERS OF THE GENERA.

1. *RANA* (Celtic, *ran*, he cries out.) Head triangular, upper jaw armed with a row of fine teeth on its edge, and an interrupted transverse row on the palate; a pair of extensible vesicles behind the angles of the lower jaw in the male; body of slender form; anterior limbs furnished with four toes distinct, posterior legs very long, powerful, and provided with five webbed toes more or less completely; skin generally smooth, but slightly granulated on the belly.

2. *CERATOPHRIS*. Head large; skin granular; tongue heart-shaped; upper eyelid prolonged into the form of a horn; mouth wide; limbs short; toes four; webs small.

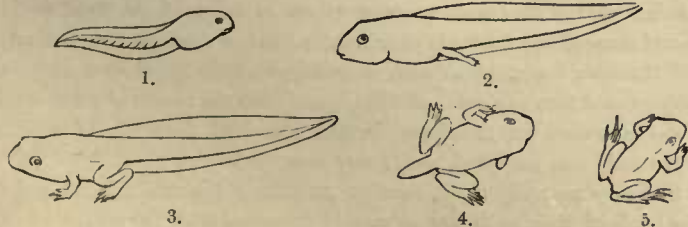
3. *HYLA*; 4. *BUFO*; 5. *PIPA*. Under the Linnæan genus *Rana* are included not only the True Frogs, but also the Tree Frogs, Toads, Pipas, from which, however, they are remarkably distinguished by the following characters: the Tree Frogs, *Hyla*, have a large expanded membrane at the tips of their toes shaped like an inverted saucer. The Toads, *Bufo*, have a more bulky form, shorter limbs, and no teeth in the jaws; their skin is covered with numerous warts, and behind each ear is a large mass of pores; they crawl and rarely leap. The Pipas, *Pipa*, have the body flattened, a broad triangular head which has neither teeth nor tongue, the eyes are very small and placed near the edge of the upper jaw; the bony larynx is of enormous size; each toe of the fore foot is cleft at its tip into four small points, and the hind feet are five-toed and strongly webbed.



Skeleton of Frog.

ECAUDATA.—DESCRIPTION OF THE SPECIES.

RANA—*Frog*. Like the other genera of this order, Frogs, when first excluded from the egg, have not their perfect form, but undergo a series of changes which are not complete till the lapse of one hundred days, and in others, one hundred and forty days after the eggs have been first dropped from the parent. Till the animal has assumed its perfect form, it is furnished with a tail, which drops off in the last stage of the metamorphosis. During a considerable period of its progressive change, it is entirely an aquatic animal, and furnished with gills, and is also a vegetable feeder, but as it approaches perfection, the gills are absorbed, lungs are produced, and the Frogling, leaving the water, begins to feed on insects, which subsequently become its sole food. The progressive changes which the Tadpole undergoes from the time it emerges from the shell, till it becomes a perfect Frog, will be best understood by the following figures: 1. Tadpole just born; 2. Hinder feet produced; 3. Anterior feet developed, and the tail diminished; 4. Animal perfectly formed, but with a tail; 5. A perfect Frog; tail gone.



The apparatus of the tongue is very curious; its base is attached to the back of the lower jaw, and its tip, which is bifid, is directed backwards when at rest; by this position it is not only enabled to protrude its tongue to a very considerable distance, but also to render it narrower or wider as may suit its convenience. The tongue is bedewed with a very viscid secretion, so that whatever it touches adheres to it. The eyes are very prominent and convex, enabling them to see in every direction, both before and behind, so that they easily perceive and escape from enemies, which they have not strength to resist. Their skin is very smooth, and covered with a slippery slime which renders them difficult to hold. Townson has

observed, from experiment, that the skin has the power of absorbing fluids to a very considerable extent, so as, he imagines, to preclude the necessity of the animal taking water by the mouth. He states, that if a Frog be placed on moist blotting-paper, it becomes twice as heavy as before, in the space of an hour and a half; and, also, that fluids, instead of passing off by the kidneys, are given off by transpiration through the skin.

Frogs are found in moist and marshy places among the wet grass, and commonly by the water-side; some prefer the water, and some the land for the greater part of the day, but hide themselves during the heat, and come out only towards the cool of the evening, and in the morning. During winter-time they bury themselves in the mud at the bottom of ponds, and pack very closely, as if to preserve the degree of heat necessary to support life; for, although they can bear a very low temperature, and even freezing, according to Hearne's testimony, without the destruction of life, it is certain they are much affected by the state of the weather, as they leave their winter abode, and come to land earlier or later as the spring is warm or cold, and return to it in autumn as the weather becomes cold.

Frogs are predaceous; they feed on insects and their larvæ, on worms, small mollusca, and the spawn of fishes; but they will not touch anything, unless they observe it moving, and therefore presume it to be alive. They do not hunt for their food, but sit quietly watching in some cool spot, till their prey comes within five or six inches, when they dart on it with unerring precision, and, striking it with their tongue, carry it into their mouth, and swallow without masticating it. If, however, they swallow anything which displeases, they vomit it up, as Roesel saw one do with a wasp which he had offered it.

In England, Frogs are held *en horreur*, as M. Clocquet observes; but in France, and on many other parts of the Continent, some species are highly prized as dainties for the table. The most approved is the *Green Frog*, also called the *Edible Frog* (*R. Esculenta*), which is not in season till July. It is from two to three inches in length (Plate 7). The Brown Frog is also eaten, especially in the central parts of France. The latter is in season much earlier, and is generally exposed for sale in the markets, but no true gourmand would think of a dish of Frogs before July. The whole animal is not eaten, but only the hind quarters, which are skinned, and generally served up with white sauce; the taste is insipid, and not unlike the flesh of Rabbits; but they are not so commonly used for food in France as we suppose. They are caught in nets, or with hooks baited with pieces of red rag, which must be shaken to induce them to strike at it. They are devoured without mercy by snakes, fishes, and birds; the Storks, especially, are very fond of them, and were it not for them, Egypt would be overrun. The species are numerous.

CERATOPHRIS. The *Horned Frog* (*C. Varius*) is ornamented with a horn-like membranous prominence over each eyelid; it is embellished with various colours, and besides being a beautiful, is also an active little animal. It is found in temperate and tropical countries.

HYLA. The Tree Frogs differ in nothing from the True Frogs, already described, but in the adaptation of their feet (see Generic Characters) for climbing trees, or adhering to the surfaces of bodies. In summer they climb trees in pursuit of insects, but in all other respects, their habits are the same as the True Frogs.

BUFO—*Toad*. The animals forming this genus are bad leapers, their hind feet not being elongated, like those of the Frog. They are ill-looking little animals, being thick of body, squat, and covered with tubercles, and they emit a fetid milky secretion from a swelling perforated with pores, situated behind each eye.

Plate 7 contains representations of two of the species—the *Common Toad* (*B. Vulgaris*) and the *Yellow-bellied Toad* (*B. Bombina*). The Common Toad is a useful assistant to the gardener, by the ravages which it makes among the beetles, caterpillars, earwigs, and slugs. The secretion alluded to above is of an acrid nature, and is used as a means of defence against the attacks of animals, who may venture to seize it in their mouths. It is not true that the reptile spits poison; nor is it embellished in the head with a jewel, but it has instead two brilliant eyes. Dr. Buckland's opinion

of the alleged power of protracted existence peculiar to this animal, though deprived of food and air, is "that they cannot live a year excluded totally from atmospheric air; and from experiments made, by enclosing these animals in cells cut out in oolite, that they cannot, in all probability, survive two years, entirely excluded from food."

PIPA. Three species of this curious genus have been described; that represented on Plate 7 being the principal.

The head of the *Surinam Toad* (*P. Surinamensis*), the *Rana Pipa* of Linnæus, is distinctly separated from the neck, the loose skin of which forms a kind of collar; the head is of a dingy chestnut colour; the body wide, of a paler colour, and the back covered with granules, three longitudinal rows of which are rather larger than the others, and which Seba compares to pearls. In this species, Schneider has described the larynx as bony and of enormous size, resembling in shape a triangular box, within which are contained a pair of moveable bones, capable of closing the air passages. It is found in Guiana, where, like the Common Toad of Europe, it lives in dark, retired places, or on the banks of fresh water. The female is there called *pipa*, and the male *pipal*. It is a very remarkable animal, on account of the young undergoing their Tadpole changes on the back of the mother, where they are placed by the male; the skin then swells around, and imbeds them, and there the young remain till they have undergone their metamorphoses. During this period the mother lives in the water, and when the young have become perfect, they leave their nests and shift for themselves. The *Pipa* sometimes acquires eight inches in length, and has great general resemblance to the Common Toad. The negroes and the natives of Guiana make use of it for food, and consider its flesh very savoury.

Family—TAILED; *Caudata*.

ILLUSTRATIVE EXAMPLES.

PLATE 8.

Genera.	Species.	Common Name.
<i>Salamandra</i>	<i>Maculosa</i>	Spotted Salamander.
<i>Triton</i>	<i>Marmorata</i>	Marbled Newt or Eft.
<i>Salamandrops</i>	<i>Alleghanensis</i>	Menopome or Hellbender.
<i>Siredon</i>	<i>Axolotl</i>	Axolotl.
<i>Proteus</i>	<i>Anguinis</i>	Snake-like Proteus.
<i>Siren</i>	<i>Lacertina</i>	Lizard-like Siren.

CHARACTERS OF THE GENERA.

1. **SALAMANDRA.** Head flattened; ears concealed beneath the skin, and without a tympanum; jaws armed with numerous small teeth, and two rows in the palate; tongue adherent at the sides, reflected at the extremity; body lengthened, lizard-shaped, covered with smooth, scaleless skin largely provided with mucous pores; tail long, and rounded; four-footed, the front feet having four and the hind feet five nailless toes; generation ovoviviparous.

2. **TRITON.** Head flat; small teeth in jaws and palate; body lengthy, and crested in the male; tail compressed, crested above and below; toes of fore feet cleft, of the hind feet sometimes distinct, sometimes webbed.

3. **SALAMANDROPS.** Head broad and flattened; in lower jaw a single row of teeth; upper two concentric rows, the inner semicircular and palatine; tongue free anteriorly; operculum half way between the posterior edge of the gape and the fore leg; opercular cartilages three, the aperture between the hinder two; outer edge of the feet fimbriated; four toes to the fore, and five to the hind feet, the fourth and fifth of the latter webbed and clawless.

4. **SIREDON** (Gr. *σειρα*, a chain, and *ὄδον*, a tooth). Head flat, large; muzzle rounded; gape reaching to the eyes; in either jaw a single row of very small teeth, and upon the palate bones numerous close-set small teeth, disposed in an arched form; eyes small, round, and far forwards; branchial apertures four on each side, large, with four semicircular arches, the hindmost ankylosed to the trunk, the middle two armed on their inner edge with two rows of sharp denticles, and the posterior with one row, but the anterior unarmed; upon the outer side of the anterior three arches,

a narrow membrane ramifying into numerous hair-like processes; gill-flap consisting of a fold of skin; body narrower than the head, but stout, large, and very broad, with a shallow crest commencing between the shoulders, and running to the tip of the tail, which is much compressed, and there joining with another crest commencing from the vent; fore feet four-toed; hind feet five-toed, and all the toes pointed and nailless.

5. **PROTEUS.** Muzzle lengthy and flattened; edges of both jaws beset with a row of pointed vertical teeth, but the upper jaw has a few placed in a distinct row before the others; eyes very small, body slender and bare, the tail compressed vertically; legs of equal length, toes three before and two behind.

6. **SIREN** (Gr. *σειρήν*, a syren). Head small, muzzle rounded; neither intermaxillary bones nor teeth, except upon the palatine bones; eyes small, round and subcutaneous; no external ears; branchial apertures three on a side, and over each a fimbriated appendage or gill; body eel-shaped, terminating in a much-compressed tail; anterior limbs only four-toed, unwebbed, and nailless.

CAUDATA.—DESCRIPTION OF THE SPECIES.

SALAMANDRA. The Salamanders are distinguished from the Lizards by their shining, scaleless skin; by the shortness of their limbs, and the unequal length of their nailless toes; by the entire absence of a third eyelid; by the ear being completely hidden, and by the deficiency of its tympanal portion, in place of which the oval hole is covered



The Salamander.

by a plate of cartilage; by the jaws as well as the palate being armed with teeth, and by the tongue adhering on the sides of the jaw, and being reflected at its tip. As the straightness of the skinny covering of the Salamanders would prevent its growth, they are continually shedding it; Latreille says, every ten days during the warm weather. The skin is not shed entire, but in flakes, which, under the microscope, have a reticular appearance.

The body of the Salamanders is largely covered beneath the skin with glands, or follicles, which secrete and retain a considerable quantity of milky fluid, of a very glutinous nature. According to Dr. Barton's observation it does not dissolve in water, but is readily soluble in spirits of wine. When the animal is irritated it secretes this fluid in large quantities, and is capable of ejecting it to some distance. This has given rise to the report of these animals being poisonous, an imputation attached vulgarly to the Toad, which is also capable of ejecting from its pores a similar excretion. To man and the larger animals they certainly are not so; but such is not the case with those of smaller size, for Laurenti has proved that Lizards can be destroyed by it. He provoked two grey Lizards to bite a Salamander, which, after making great efforts to escape from them, at last ejected some of this fluid into their mouths; one of them died immediately, and the other was attacked with convulsions which lasted for a couple of minutes, and then expired. A third Lizard, into the mouth of which some of the same fluid was introduced, became convulsed, the whole of one side of the body was paralyzed, and it very soon died.

Still they are really timid, harmless animals, which cannot be induced to bite; indeed their teeth are so weakly connected with the jaws, that any forcible attempt to make them bite immediately detaches them; and rather than engage in any contest, they endeavour to avoid their tormentors by as speedy a flight as their slow pace will allow.

But the most remarkable property attributed to this genus is its power of living in or extinguishing fire. This has been held perfectly true for ages, and even to a very late period there have been believers of and vouchers for the fact; but the truth seems to be that the effusion of fluid from the Salamander's body, increased by the heat of the fire, would for a very short period defend it from injury, just as a damp cloth would for a time resist burning, but so soon as the moisture is evaporated both one and

the other are naturally consumed. The power of resisting heat attributed to the Salamander, led also to a report of cloth being made of their skins which was incombustible; this is mentioned by Marco Polo, in his work "De Regionibus Orientalibus," but he states that this incombustible cloth was really made of "minera quædam terræ, quæ fila producit, lanæ haud dissimilia," which was doubtless asbestos, known to the older writers as "Salamander's wool;" and of this material was probably the napkin "ex Salamandra contextam," presented to the Roman pontiff by a Tartar king, which was reported to be at Rome in Marco Polo's time, and used as a wrapper to the head-cloth of our Lord there said to be preserved.

Not more than three or four Salamanders are found in Europe, and those only in the warmer climates; but very many have been met with of late years, and described, in America.

The *Spotted Salamander* (*S. Maculosa*) is between six and seven inches in length; general colour dull-livid black, spotted and streaked with yellow; along the sides of the head and body are some rows of tubercles, which consist of follicles secreting a kind of milky fluid, acrid, and capable of being projected to some distance when the animal is irritated. They are found in France, and in the warmer parts of Europe, but are not met with in this country.

TRITON—Eft. This genus was separated by Laurenti from the Salamanders on account of their compressed, fin-like, instead of rounded or quadrangular tail, and their aquatic habits. They are, moreover, distinguished from the Salamanders in being oviparous, instead of ovoviviparous. They deposit their eggs either single or in patches of two to four, but still distinct, on the corner of some plant standing in or on the water, to which they are fixed by a clammy jelly, which also fastens the leaf together. The larvæ, when first hatched, have no feet; in which respect they resemble the Tadpoles of Frogs and Toads, but they are distinguished from them by the fore legs being first developed, whilst the complete number of toes on the hind feet does not at first appear. At their very first escape from the egg, and previous to the formation of the mouth, they have a filamentous production in front of the gills and on the under surface of the head, by means of which they fix themselves to water-plants. They are carnivorous, feeding upon insects, worms, and small molluscs. As to their tenacity of life, Dufay mentions the remarkable fact, that they may be frozen up in the ice for a long time without being destroyed. Their capability of reproducing parts which have been injured or amputated is very astonishing, and has been largely experimented on by Spallanzani; so that the tail and limbs are found restored after five or six successive amputations in the same summer.

Many species of this genus have been enumerated than really exist, in consequence of difference of colour, both as to age and at different periods of the year, having been described as distinct species. They are divided into—1. Efts with all the toes unwebbed; 2. Efts with hind toes half-webbed; and 3. Efts with hind toes completely webbed.

The *Marbled Eft* (*T. Gesneri* or *Marmorata*) measures from eight to nine inches in length, of which the tail is one-half; upper surface rather pale olive-green, sprinkled with large brownish spots, or irregular marblings, extending on the dorsal crest, which is not deep or dentated; under parts blackish or brownish, and sprinkled with numerous white granular pores upon the sides, neck, and throat; upper half of tail spotted or marbled with deep brown, and separated by a white or reddish band from the lower brown half. Is a native of the south of France, has a very fetid odour, and lives in pools; but sometimes, in hot and stormy weather, it comes ashore, and trails itself with seeming difficulty to some shady spot more or less distant. In winter it resorts in small parties to the holes in rotten trees, probably for hybernation.

SALAMANDROPS. The remarkable animal on which this genus is founded was discovered by the French traveller, Michaux, in the Alleghany Mountains. There is but one species:—

The *Menopoma* (*S. Alleghanensis*). It is about two feet in length, and sometimes more; of a very uncouth and disgusting form, is much dreaded by fishermen, and believed by them to be poisonous. It is found in the

Ohio and Alleghany rivers; lives in the water, eats flesh, and spares nothing it can devour. The Indians call it *Tweeg*, and by the Anglo-Americans it is called *Hellbender*, *Mud Devil*, *Ground Puppy*, and *Young Alligator*.

SIREDON—Axolotl. The curious animal upon which this genus is founded was first described by Francisco Hernandez, in 1651, under the name of *Axolotl*. He speaks of it as a kind of pond fish, covered with soft skin, four-footed like Lizards, about nine inches long and an inch thick, but sometimes exceeding eighteen inches in length. Since then, however, several descriptions of the reptile have been given. It is found in the Lake Tezcuco surrounding the city



The Axolotl.

of Mexico, and also in the mountain lakes and cold waters of that district. It is eaten by the lower orders, and is called *Ajolata* or *Aholata*. (Plate 8.)

PROTEUS. This remarkable genus, one of the two which form an intermediate link between the Batrachian Reptiles and Cartilaginous Fishes, has a general resemblance to the Salamanders, but has more vertebræ and fewer ribs, and the form of its skull differs entirely. It is furnished with a double respiratory apparatus, so that it is truly amphibious.

Considerable dispute has existed as to the *Proteus* being a perfect animal. Hermann, Schneider, and Linnæus considered it to be the larva of some Salamander; but after the most diligent investigation by Schneider and Cuvier, they have come to the conclusion that it is a perfect animal, and that it retains both kinds of respiratory organs throughout life.

The *P. Anguinus* (Plate 8) varies in length from nine to thirteen inches, and probably depending on the animal's age; its colour light red, and the branchial appendages deep blood coloured, according to Dr. Schreiber's account; but Sir Humphry Davy says, "it is of a fleshy whiteness and transparency in its natural state, but when exposed to light its skin gradually becomes darker, and at last gains an olive tint."

The *Proteus* was first discovered by Baron Zois in 1795, in the Grotto of Maddalena at Adelsberg, and subsequently, though rarely, about thirty miles distant, in the Sitticher See, thrown up with water from a subterraneous cavity. None were discovered subsequently till 1799, and it therefore seems that although the overflowings of the numerous lakes in this district, which seem to communicate with one another, occur generally once or twice every year, yet the appearance of the *Proteus* is always correspondent with them. Sir H. Davy thinks there can be no doubt "that their natural residence is in an extensive subterranean lake, from which in great floods they sometimes are forced through the crevices of the rocks into the places where they are found."

Mr. De Geen has given, in the "Journal of the Academy of Natural Sciences of Philadelphia," another account of a second species of this genus, which he calls the *Proteus* of New Jersey.

SIREN. The first mention of the curious animal which forms this genus was made in a letter, dated May 18, 1765, from Dr. Garden, of South Carolina, to Linnæus; since which period it has come under the observation of several naturalists. Three species are described, one of which burrows in the ground, another in the mud, and the last in both.

The first is the *S. Lacertina* (Plate 8), which measures from three to three and a half feet long, the body resembling that of an Eel; the head is not separated from the trunk by any neck, is of a rounded form, and terminating in a blunt muzzle; the mouth rather small, and the upper projecting a little beyond the lower lip, but neither fleshy nor supported by bone, as in fishes; the nostrils are two very small apertures near the edge of the upper lip; the eyes, placed above the corners of the mouth, are small, round, and are visible through the skin which passes over them, as they have not eyelids; no appearance of any ear.

The skin is smooth and not in the least scaly, but examination of it with a glass presents numerous slightly-elevated points and corresponding depressions. The general colour of the animal is deep blackish-brown, with numerous small whitish points above and beneath of a paler colour.

CLASS IV.—PISCES.

This class of vertebrate Animals are inhabitants of the waters, in which element they live, move, and in general obtain their prey. They are oviparous, have a double circulation, and breathe through the medium of water, for which they are provided with branchiæ or gills—an apparatus which separates the oxygen from the atmospheric air. They urge themselves forward by striking the water right and left with their tail. Their fins, answering to arms, are called *pectorals*, and those corresponding with feet are named *ventrals*. They are classed into two series—Bony Fishes and Cartilaginous Fishes.

BONY FISHES. PISCES OSSEI.

BONY or ordinary Fishes are characterised by having bones in the skeleton; they are divided into Spinous and Soft-finned Fishes.

ORDER I.—ACANTHOPTERYGIA. SPINE-FINNED.

THE Spine-finned Fishes include by far the greater number of Ordinary Fishes. The families of which they are composed have been arranged into one Order; they are characterised by spinal rays in the first dorsal, if there be more than one dorsal, or spinal rays in the first part if there is one dorsal only; in some, instead of a first dorsal, there are free spines without any connecting membranes. The first rays of the anal fin are also spinous, and the ventrals generally have at least one spinal ray.

ILLUSTRATIVE EXAMPLES.

PLATE 1.

Family—PERCH; *Percoida*.

Genera.	Species.	Common Name.
Perca - - - -	Fluviatilis - - - -	Perch.
Trachinus - - - -	Draco - - - -	Common Weever.
Mullus - - - -	Barbatus - - - -	Smaller Red-beard.

Family—GURNALS; *Triglida*.

The principal distinction between the family *Triglida* and *Percoida* consists in the extension of the suborbital bone (more or less) over the cheek of the former family, and in its articulation with the operculum.

Trigla - - - -	Gurnaidus - - - -	Red Gurnard.
Dactylopterus - - - -	Mediterraneus.	

Family—MAIGRES; *Sciænida*.

The Maigres differ from the Perches in the absence of teeth on the vomer or palate: like the Perch family, their preoperculum and operculum are both notched.

Sciæna - - - -	Umbra.	
Amphiprion - - - -	Ephippium - - - -	Saddle-fish.

CHARACTERS OF THE GENERA.

1. PERCA (Gr. *περκη*, *perch*, so named because spotted with black). Body oblong, compressed, generally covered with tough scales; mouth tolerably wide, and teeth in the jaws, transversely across the vomer, generally, also, longitudinally in the palatines, and on the pharyngeal bones and denticles of the gills; gills wide, the membrane supported by rays never less than five, rarely more than seven; the opercule and preopercle differently armed; ventral fins under the pectorals, and two dorsal fins generally a little apart from each other.

2. TRACHINUS. Head and body lengthy and compressed; eyes near the tip of the short muzzle; gape obliquely upwards; bands of villous teeth on both jaws, on the front of the vomer, on the palatine and pterygoid bones; opercule armed with one long spine; supra scapular bone dentated; first dorsal fin very short, and entirely supported with very sharp spines; second long, and all its rays soft; pectoral fins very large.

3. MULLUS. Body oblong, head of moderate size and sloping gills; no teeth in the upper jaw, but large flat teeth in the palate; eyes large and near each other; beneath the middle of the lower jaw, a pair of long barbs; no spine on the opercule; three rays in the branchial membrane; the head

and body covered with large and loosely attached scales; dorsal fins two, distinct from each other; ventral beneath the pectoral fins.

1. TRIGLA (Gr. *τρίε*, *three*)—on account of its three loose pectoral rays. Head nearly square, covered with bony plates, muzzle cleft, forming two projecting and denticulated lobes; teeth in both jaws and in front of the vomer very numerous, small, and pointed; the suborbital and opercular bones spiny, and a spine upon the shoulder; dorsal fins two, the rays of the first spiny, and of the second flexible; pectoral fins large and long, their lower three rays detached and distinct; gill aperture large; branchial rays seven; body lengthy and roundish; caudal end of the lateral line forked.

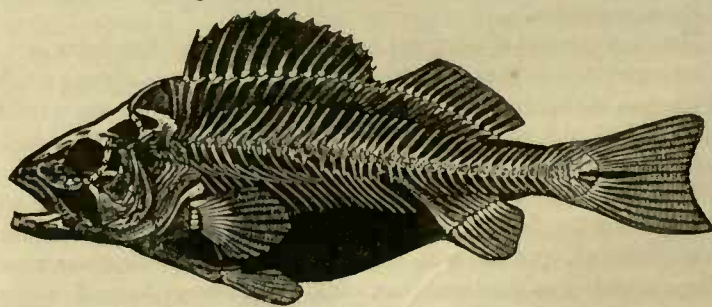
2. DACTYLOPTERUS. General characters same as *Trigla*; pectoral fins fan-like and very large.

1. SCIÆNA. Head bulky, entirely covered with scales, supported by cavernous bones; under part of the lower jaw studded with pores; no teeth on the tongue, vomer, or palatine bones; edges of the jaws armed with teeth; preopercle denticulated; opercule terminating in points; branchial rays seven; dorsal fins two.

2. AMPHIPRION. Preoperculum, and three operculum pieces denticulated, the later produced on a single row of blunt teeth.

PERCOIDA; TRIGLOIDA; SCIÆNIDA.—DESCRIPTION OF SPECIES.

PERCA—*Perch*. All the large group of fishes of which this genus is composed is predaceous as the pointed form of their teeth indicates, and almost all live either in fresh-water lakes and rivers, or at the mouths of the latter where emptying themselves into the sea. They are pretty generally spread over the globe, and are much esteemed for food, being mostly of a fine flavour, and easily digested. From some minor differences they have been divided into five subgenera.



Skeleton of Perch.

The *Common Perch* (*P. fluviatilis*) is about fourteen inches in length, and occasionally eighteen or twenty inches; its colour on the back is deep green, golden lower down, dingy-white on the under parts; from the back descend five or six deep greenish bands, which gradually are lost on the sides; the first dorsal fin is violet, with a large black spot between the twelfth and fourteenth rays, and sometimes it has dark patches on other parts; the second inclining to greenish-yellow; the pectorals transparent and reddish-yellow; the ventrals, anal, and edge of the caudal bright vermilion, the rest of the latter deep red inclining to black at its base.

TRACHINUS—*Weever*. The name *Trachinus* has been applied to the genus by Artedi, from its trivial Italian name *trascina* or *trascina*, a presumed corruption of *δράκαινα*, its modern Greek name. In Provence it is called *Araignée* or *Aragno*, and in Spain *Aragna* or *Aragniol*, from the

Latin *aranea*, a spider. These trivial names render it probable that it is the fish known to the older naturalists by the words *draco* and *araneus*, which appears to be confirmed by the corresponding manners of both. Its French name, *Vive*, is believed by Belon to depend on its long tenacity of life after removal from water, and the English term *Weever* is probably only a corruption.

The *Common Weever* (T. *Draco*) is about twelve inches in length, and even more; irides yellow; scales range in twenty-five oblique lines from above, downwards and backwards between the gills and tail, and the lateral line formed by a series of oval scales; head brown, with darker spots; gill-covers striped with yellow; back brown, sprinkled with a few azure-blue spots; sides and belly tinged and spotted obliquely with jonquil-yellow on a pale brown ground; first dorsal fin black to the fourth spine, the rest white, as are also the second dorsal and anal fins, which are marked longitudinally with a broad jonquil band, and the rays of the latter reddish-grey; caudal fin whitish, spotted with jonquil, and edged with black. The colours are most brilliant in old fish, but the blue and yellow fade very soon after death. This species is found in the British Channel and in the Mediterranean. It swims near the bottom, is sometimes taken in deep water with the trawl net, and even by the hook attached to deep-sea lines. It strikes violently with spines, so that it needs very careful handling; for the wounds, as Pennant states, are very painful, attended with violent burning pain, and most pungent shooting, accompanied sometimes with inflammation up to the shoulder.

MULLUS—*Surmullet*. The fishes belonging to this genus are remarkable for the beauty of their colour, and the delicacy of their flavour, and were held in high estimation by the ancients. Juvenal, in his Xth Satire, mentions one as having been sold for 6,000 sesterces, a sum nearly equal to 47*l.* sterling. Seneca, in his XCVth Epistle, mentions another presented to Tiberius, who thought it better worth sending to market than eating, and which being bid for by Apicius and Octavius was carried off by the latter at the trifling cost of 5,000 sesterces, or nearly 39*l.* And Suetonius, in his "Life of Tiberius," mentions three which together produced 30,000 sesterces, or about 234*l.* of our money; an extravagance which induced the Emperor to establish sumptuary laws, and to tax the provisions brought into the market. Nor do these epicures seem to have been satisfied with the enormous price of their favourite fish; they delighted in having them brought alive to table in large crystal vases, that they might enjoy the pleasure of seeing the varying colours of the dying fish, and that it might be eaten as fresh as possible. Galen mentions that the liver was considered the most delicious part, and was mashed up in wine as a sauce for the whole fish.

Surmullets prefer rooting about near the shore like hogs in the sand, or mud, leaving their marks in shape of round holes. They are very cunning, and in the attempts to take them, the whole shoal often escapes by leaping over the nets.

The *Smaller Redbeard* (M. *Barbatus*) is about eleven inches in length; it is distinguished by its vertical head, and by its deep and uniform red or carmine colour; the under parts are silvery; fins yellow. It is principally found in the Mediterranean, and very rarely in the British Channel.

Other genera of this family:—

ATHERINA. The most common species is the *A. Hepsetus*, the *Smelt* of Southampton.

BODIANUS. A sea-fish like the Tench; it has spines only on the opercle.

CANTHARUS. About the size of a herring; opercle neither spined nor notched.

COTTUS—*Bullhead*. It lives under stones in the beds of rivers; a few of them are British species.

GYMNOCEPHALUS—*Ruffe*. Similar in form to the Perch.

MALTHE. Including the *Sea-bat* of South America.

PARALEPIS. Called *Lussions*, at Nice, from their resemblance to small Pike.

PERCIS. Distinguished by its flat head; resembles the *Trachini*. About five or six inches in length.

PERCOPHIS. Remarkable for possessing the characters of the Perch with the form of the Snake.

PLECTROPOMA. Resembles the Serrani; the species are inhabitants of the seas of hot climates; varying from three to seventeen inches in length.

POLYNEMUS. Natives of the seas of hot countries; varying from three to fifteen inches in length; are highly esteemed for the table.

PRIACANTHUS. Covered with rough scales on head and body; from six to fifteen inches in length; good eating. The *Bull-eye* of St. Helena is one of the species.

SERRANUS. This most extensive genus, is distinguished from *Perca* and *Labrax* by its single and lengthened dorsal fin, and is very remarkable for the saw-like edging of its preopercle, which, in many of the species, becomes so fine as to be almost imperceptible. Risso states that these fish swim with open mouth, and darting on their prey with the rapidity of an eagle, devour immense quantities of Herrings, Spari, and other fish which consort in shoals.

SILLAGO. A genus formed from certain species of other genera not previously known; natives of the Indian and Australian seas. They vary in length from six to twelve inches, and in appearance and flavour resemble the whiting.

SPHYRÆNA. These are fierce, voracious, and active fishes; varying in length from four to thirty-six inches. The form of these animals, it was supposed by Schneider, resembled a stake, hence their name *σφυραίνα*, "a stake."

THERAPON. Has the general form of the Perch; some species are about ten inches in length; natives of the East Indian Seas.

TRICHODON. Well known to the Kamtschatkans; its habits resembles the Weevers in hiding itself in the mud, in which the female spawns. It varies from seven to ten inches in length.

UPENEUS. All the species are natives of hot climates; they were formerly included under *Mullus*. Some of the species are of similar form to our Red Mullet. Vary from five to nine inches.

URANOSCOPUS. Solitary fishes, about a foot long, living in the mud; remarkable for the great size of their suborbital bones, and being armed with a spine suitable for an offensive or defensive weapon. Found in the Indian Seas.

TRIGLA—*Gurnard*. When these fish are taken from the water they utter a sort of grunt, whence, perhaps, their French name, *Grondins*; this probably arises from the escape of the air from the swim-bladder by the pressure of the hand. They are divided into two sections: 1. Gurnards with their body nearly surrounded with transverse thread-like lines, or ridges; and 2, those whose body is without transverse lines. The *Red Gurnard* (Plate 1) is from twelve to sixteen inches long. Its general colour is bright red, with the sides and belly silvery; fins reddish-white. It is a native of the Mediterranean and Atlantic, being found on the shores of America as well as Europe, and is very common on our own southern and western coasts. It feeds on crustaceans principally, and spawns in May or June. The number of the species is about sixteen.

DACTYLOPTERUS. These fishes are in many respects allied to the Gurnards; they are only about a foot in length; are found in the Mediterranean and Indian Ocean, and are celebrated for their power of springing out of the water, and sustaining themselves for a time in the air. They must not, however, be confounded with the true Flying Fish, of the genus *Exocetus*. When pursued by the Corypheni, and other voracious fish, these little animals expand their parachute-like pectoral fins, and spring from the water, only to be devoured, probably, by the gulls; or, on their descent into the water, to be seized by the enemy from whom they had just endeavoured to escape.

The illustrated species, *D. Volitans*, or *Mediterraneus* (Plate 1), is common in the Mediterranean Sea.

Other genera of this family:—

PERISTEDION. Closely allied to the genus Trigla; they have, however, broad scales on the under part of the body, forming a shield, which, being connected with the upper scales, encircle the animal like a coat of mail.

PLATYCEPHALUS—*Broadheads*. Natives of the Indian Seas; they bury themselves in mud; vary from fifteen inches to two feet in length.

PRIONONOTUS. Closely allied to the genus *Trigla*.

PTEROIS. Natives of India; slightly distinguished from the *Scorpenæ*.

SCORPENA. The great size and roughness of the head, and the soft spongy skin which they are generally enveloped, give to the *Scorpenæ* a frightful and disgusting appearance, whilst their prickles render them formidable; hence the names of Sea Scorpion, Toad, and Devil have been freely applied to them. They are found in the Mediterranean, Atlantic, Indian, and South Seas.

SEBASTES. They have great resemblance to the *Scorpenæ*, except that the head is less armed with tubercles, whilst, on the contrary, it is completely covered with scales.

SYNANCEIA. Their external form connects them with the *Uranoscopi*, and is extremely hideous, and their filthiness has led the Indian fishers to suppose them venomous.

SCIENA—Maigre. This genus, which includes a large number of species, is divided into three sections—Maigres, Otolithes, and Corbs.

The species *S. Aquila* (Umbra) belongs to the first subgenus. It varies in length from three and a half to six or seven feet. Its colour is silvery-grey, with a brownish tinge towards the back, and whitish on the belly; the first dorsal, the pectoral, and ventral fins are bright red, and the other fins are reddish-brown. This fish is a native of the Mediterranean, and occasionally, though rarely, taken in the British Channel. According to Dnhamel, the fishermen of Royan consider the appearance of the Maigre as indicative of the approach of the Sardines, whilst at Dieppe it is held to usher in the Herring; a circumstance only explained by the predatory habits of the fish inducing it to hover about the approaching shoals of its finny prey. When moving together in great numbers they are said to utter a very loud grunting noise, which may be heard from the depth of twenty fathoms. Cuvier considers it certain that, according to the description left by Salvian, it is the same as the fish in his time called in the Roman markets *Umbrina*, which name Salvian attaches to it, and believes it the same as the famous *Umbra* of the ancients. It was then highly valued as a table dainty, but by some chance has of late years been so scarce, probably from shifting its ground, that Cuvier with the greatest difficulty succeeded in obtaining a few specimens from the coast, the Parisian market being unable to furnish any; though in the sixteenth century so common as to give rise to the proverb, *Il vient de la Rochelle, il est chargé de Maigre*.

AMPHIPRION. The members of this genus, especially the species *Ephippium* (Plate 1), are very closely allied to the *Chætodons*, which see p. 113.

Other genera of this family:—

PRÆMNAS. Nearly resembling the *Amphipriones*.

PRISTIMOMA, SCOLOPISIDES, and UMBRINA. All closely related to the *Sciæna*.

ILLUSTRATIVE EXAMPLES.

PLATE 2.

Family—BREAM; *Sparoida*.

The figure of the family *Sparoida* resembles the Maigres; they are destitute of teeth in the palate, of scales on the fins, of notches in the preoperculum, and of spines in operculum. Their gill-rays are six, arranged in the form of teeth.

Genera.	Species.	Common Name.
<i>Sargus</i> - - - -	<i>Annularis</i> - - - -	Ringed Sparus.
<i>Dentex</i> - - - -	<i>Vulgaris</i> - - - -	Sea Rough.

Family—MÆNOIDE.

The *Mænoidæ* differ from the *Sparoida* in the great extensibility of the upper jaw, which is advanced or withdrawn by means of long intermaxillary pedicles.

<i>Mæna</i> - - - -	<i>Vulgaris</i> - - - -	Cockerell.
<i>Smaris</i> - - - -	<i>Vulgaris</i> - - - -	Pickarell.

Family—SCALY FINS; *Squammipennata*.

The fins of the family *Squammipennata* are so covered with scales as not to be easily distinguished from the rest of their bodies.

Genus.	Species.	Common Name.
<i>Chætodon</i> - - -	<i>Striatus</i> - - - -	Streaked Chetodon.
<i>Brama</i> - - - -	<i>Atropus</i> .	

CHARACTERS OF THE GENERA.

1. **SARGUS.** Jaws slightly extensible; molar teeth disposed like a pavement, in front incisive teeth similar to those of man; dorsal fin single and extended; opercles neither spined nor denticulated; height of the body nearly equal to its length.

2. **DENTEX** (Lat. *dens*, a tooth). Jaws furnished in front with large long-hooked teeth, on the sides with conical teeth; behind the front teeth are small teeth arranged in tufts.

1. **MÆNA.** Five narrow teeth in jaws, and a row on the vomer; great extensibility of the upper jaw, under the control of intermaxillary pedicles.

2. **SMARIS.** Both jaws furnished with a narrow row of very fine teeth, but none in the vomer; mouth protractile; body spindle-shaped.

1. **CHÆTODON.** Teeth resembling hairs in length and fineness, and set in rows; body compressed, and very deep vertically; dorsal and anal fins covered with scales similar to those of the back.

2. **BRAMA.** Forehead very perpendicular; tail forked and rigid.

SPAROIDA; MÆNOIDA; SQUAMMIPENNATA.—DESCRIPTION OF THE SPECIES.

SARGUS—Star-fish. The Sars are shore fish; are common on the southern coasts of France and elsewhere, but are not found in the British Channel. They feed generally on small shell-fish and crustaceous animals. There are about eighteen species.

The *Annular* or *Ringed Sparus* (*S. Annularis*) is of slender proportions; the head a fourth of the total length of the body, which is seven inches; muzzle rather pointed; the profile, being a continuation of the curve of the back, gives to the body an oval form; the protuberance between the eyes slight; upper lip thick and not plaited, lower thin and without a tubercle; incisive teeth vertical, wider, cut more square than in any other species, and more closely resembling the incisive teeth of man; molar teeth very numerous and closely set in three rows in the upper jaw, and in two or three in the lower; caudal fin cleft, and its two lobes rounded on their inner edges. The back of this species is yellow, inclining to golden, and each scale above the lateral line edged with greyish-brown; the belly silvery-grey; the spot on the tail deep black; dorsal and caudal fins grey tinged with yellowish; pectorals grey; ventrals bright orange-yellow; anal fin orange. They are found in great numbers in the Mediterranean, as well on the rocky coast of France, Tuscany, and Italy, as on the muddy shores of Lower Egypt; and they are also taken off the Canaries.

DENTEX. This genus has been separated by Cuvier from the *Spari*, on account of the difference in the form of the teeth; he enumerates five certain species, one of which, the *Sea Rough* (*D. Vulgaris*), is figured on Plate 2. They are for the most part natives of the seas of hot climates.

Other genera of this family:—

BOOPS. The eyes of the fish belonging to this genus are very large, whence the generic name from the Greek *βοῦς*, an *Ox*, and *ὤψ*, an *eye*. They are natives of the Italian seas, and are herbivorous. One species, the *Boga* of the Italians, was believed by Gessner to have the power of uttering a cry, whence it got the name of *Box*, a corruption of *βοάξ*, from the Greek *βοάω*, *I cry*; but no one believes this story now.

CHEILODACTYLUS. Upper lip thick; rays of pectoral fins like fingers; scales large.

SCATHARUS. Seven inches long; oval; scales small; pectoral fins long.

MÆNA. This genus is found in the Mediterranean: their body is shaped like a herring, which is lead-coloured on the back and silvery on the belly.

SMARIS—Picarel. The *Picarels* are distinguished from the genus *Mæna*, to which they are, in almost every respect, similar, by the absence of teeth

in the vomer. They are found in the Mediterranean and in the Atlantic, living near the shore in muddy, weedy parts, and feeding upon small fish and molluscous animals.

The *Common Picarel* (*S. Vulgaris*) is about eight inches in length; head pointed; mouth not large; inferior jaws has two cuspid teeth at its tip; eyes large; preopercule rather large, its limb prominent, and marked with parallel vertical striæ; opercule of moderate size, connected with the subopercule; interopercule very narrow and indistinct, although separate from the other pieces, all of which and the cheek are scaly; branchiostegal membrane narrow and supported by six rays; body covered with strong rough scales; dorsal fin commencing with the second third of the length of the body, and about half its depth in height, the membrane connecting its eleven spiny and some branching rays very delicate; anal fin supported by three spiny and four soft rays; pectoral fins long and narrow; caudal slightly forked; the general colour of the fish is silvery-grey, deeper on the back, and lighter on the belly. It is so abundant at Iviça, that it forms more than half of the fishery.

CHATODON. The animals which compose this genus are all natives of the Torrid Zone; but it is a curious geological fact, that some of them have been found near Verona in a fossil state in good preservation, such as the *C. Pinnatus*, which is never found but in the sea of Japan or the coasts of India and Arabia. The *Chatodons* form beautiful subjects for painting, on account of the elegance and variety of their colours. They are divided into five subgenera, of the first of which the *Streaked Chatodon* (*C. Striatus*), is a species (Plate 2). These have neither spines nor notches upon the opercule; the body is oval; the dorsal spines following lengthways; thirteen spines to the dorsal fin; tail rounded; general colour yellow, marked with four or five large transverse brown bands; pectoral and caudal fins blackish. The species are numerous.

BRAMA—Bream. Of this genus there seems to be but one species well ascertained, viz., *B. Raii* (Schneid.); *Sparus Raii* (Bloch); *B. Marina* (Ray); *B. Atropus*; *Sea Bream*. It measures about two feet in length, and has much the figure of the common Bream; the mouth is directed upwards; the dorsal fin extends along the whole length of the back to the tail, and is covered with broad stiff scales, as are also the anal and caudal fins; the teeth long and hooked; the back black and becoming lighter by degrees, till the belly is of a silvery colour; all the fins of a dingy red except the dorsal, which is reddish at its base, but of a bluish-green above. They are found, according to Lacepède, in the strait which divides England from France, along the western French coast, and near the Cape of Good Hope, and sometimes on our own coast. They are considered very good for the table.

Other genera of this family:—

EQUES. Body cuneiform; tail pointed; mouth narrow.

FIATOLA. Abundant in the Mediterranean; good for food; form oval; single row of small teeth.

KURTUS. Four species, found in the Indian seas; body oval; lower jaw shorter than the upper; fine teeth like velvet.

OSPHRONEMUS. Indigenous to China and Batavia; it is a well-flavoured fish; is abundant.

SCORPIS. Only one species, found in New Holland.

TOXOTES. Only one species, nearly allied to the *Chatodons*.

ILLUSTRATIVE EXAMPLES.

PLATE 3.

Family—MACKERELS; *Scomberoida*.

The Mackerels form a very large family, all of which are highly serviceable to man, and for the capture of which many extensive fisheries have been established.

Genera.	Species.	Common Name.
<i>Scomber</i>	<i>Scomber</i>	Mackerel.
<i>Xiphias</i>	<i>Gladius</i>	Sword-fish.
<i>Zeus</i>	<i>Faber</i>	Doree.

Family—BAND-FISH; *Taxioida*.

The Band-fish have a close resemblance to the Mackerels (*Scomber*).

Genera.	Species.	Common Name.
<i>Trichiurus</i>	<i>Lepturus</i>	Hairtail.
<i>Stylephorus</i>	<i>Chordatus</i>	
<i>Cepola</i>	<i>Rubescens</i>	Red Band-fish.

Family—THEUTYES; *Theutida*.

The Theutyes are, in some respects, like the Mackerels; but they differ from them in having trenchant spines on the sides of the tail, and a horizontal spine before the dorsal.

Amphacanthus - *Guttatus*.

CHARACTERS OF THE GENERA.

1. **SCOMBER.** Teeth pointed, a row in each jaw; body spindle-shaped, covered with small scales; two dorsal fins far apart, the first continuous, the second and the anal divided into several false fins; pectoral fins of moderate size; ventrals far forward; each side of the tail furnished with two little crests, but no keel; most of them provided with an air-bladder.

2. **XIPHIAS** (Gr. *ξίφος*, a sword). Body lengthy, and covered with small scales; lateral line unarmed; upper jaw, consisting of the vomer and intermaxillaries, lengthened into a long sword-like process; no teeth, except on the pharyngeal bones; dorsal fin single and lengthy; no ventral fins; on each side of the tail a strong keel; branchiostegous rays seven.

3. **ZEUS.** Mouth projectile; small teeth; body oval, deep, and compressed; dorsal fin single, its spiny separated from its soft part by a deep notch. In one section the surface is smooth; the dorsal spines send up long filamentous, membranous processes; along the dorsal and ventral edges of the body, on each side, a row of short, stout spines; ventral fins under the throat, lengthy. In the other section the surface is rough; the dorsal fin has no filaments, nor are the edges of the body spiny; the ventral fins are on the belly, shorter, with one strong spine, and the rest soft and branching; in both the tail projects suddenly, and shallow from the body, and its rays are branching.

1. **TRICHIURUS** (Gr. *τριξ*, a hair, and *οὐρά*, a tail). Head pointed, and lower jaw projecting beyond the upper; teeth strong, pointed, and cutting; body scaleless, lengthy, compressed, riband-shaped, and the tail prolonged into a slender compressed thread; dorsal fin extending along the greater part of the ridge of the back; instead of the anal fin a series of minute spines are placed on the under part of the tail; ventral and caudal fins deficient; branchial rays seven.

2. **STYLEPHORUS** (Gr. *στυλος*, a column, and *φέρω*, I bear). Head lengthy, narrow, expanded behind, but terminating anteriorly in a very long trunk, at the end of which is the mouth unfurnished with teeth; eyes lateral, large; opercles very small, branchial rays five or six, and very slender; body long, slender, and quadrangular on the back; dorsal fin extending along nearly its whole length; caudal supported by six rays, of which the last is horizontal and twice as long as the body; no ventral fins.

3. **CEPOLA.** Body and tail long and compressed in form of a riband; belly almost as long as the head; besides the long dorsal fin they have a distinct caudal and long anal fin; mouth facing upwards on account of the shortness of the upper jaw; teeth strong and pointed, slightly serrated.

1. **AMPHACANTHUS** (Gr. *ἀμφί*, on both sides, *ἀκανθός*, a thorn, and *οὐρά*, a tail). Body compressed, oblong; mouth small; a single row of trenchant teeth in the jaws; other characters same as *Scomber*.

SCOMBEROIDA.—DESCRIPTION OF THE SPECIES.

SCOMBER—Mackerel. Mackerel live in shoals, and make their appearance very regularly at certain seasons in particular places; they are very valuable as articles of food, and are sought after with great avidity. The scales covering their body are almost imperceptible. They are found both in the old and new continent, but never lower than the Canaries. A very

curious circumstance with regard to this genus is, that some are unprovided, whilst the greater number are furnished, with an air-bladder.

The *Mackerel* (*S. Scomber*) is from one to two feet, of which the head measures rather more than a fifth; lips rather fleshy; the cheek is covered with some peculiar long-pointed scales directed backwards, which seem to form plaits rather than scales; the body covered with very small scales, as it were blended in with the skin; lateral line, passing along the upper part of the body, straight from the head to the tail; the colour of the back is blue-steel, iridescent with green, gold, and purple, relieved with nearly straight or undulating black lines; sides and belly silvery, with purple and gold glossings; anal, and often the ventral, fins flesh-coloured; the false anal fins silvery, and all the other fins grey. Towards the latter end of May, and during the months of June, July, and even in the early part of August, Mackerel are caught full of roe, but they begin to spawn in June, and, according to Bloch, 540,000 eggs have been counted in the roe of a single female. Mackerel, according to Mr. Yarrell, feed probably on the fry of other fish, and at Hastings follow towards the shore a small kind of *Clupea*, commonly known there as *Mackerel Mint*, and which he suspects to be the young of the Sprat. Mackerel are included amongst the fish which are called migratory, and said to pass from the North Seas downwards towards the south; but it is more probable, however, that the migration of the Mackerel, instead of being from north to south, is merely from deep water, to which they had retired during winter, to the coast; and this appears more likely to be the case, as they are taken nearly at the same time in the Mediterranean, in the British Channel, and in the North Sea. They have been met with as far south as the Canaries, but there is no notice of their being found nearer the tropics. The largest are said to be taken at the entrance of the British Channel, between Sorlingues and the Ile de Bas, but their flavour is not so good as those of less size. Different localities appear to have some effect on the edible qualities of this fish; those of the Channel are considered the best; at Amsterdam it is esteemed of little value; and the Icelanders set so little store on it that they will not take the trouble to fish for it. In England and France, however, Mackerel are highly prized, and their great number render them an important article of food to the poor of both countries.

XIPHIAS—Sword-fish. This remarkable genus was well known to the ancients, and mentioned by Pliny and Ovid. It consists of but a single species, for *X. Imperator*, of Bloch, is stated by Cuvier to be merely a copy of a bad figure of the known species so described by Aldrovandi.



The Sword-fish.

The *Sword-fish* (*X. Gladius*) varies from ten to fifteen feet in length; profile inclining gently towards the root of the sword, which thence stretches horizontally forwards, somewhat trigonal and tapering to a sharp point, its upper surface finely striated, the under smooth, with a slight central groove, the edges delicately toothed: under jaw sharp; sides of the head vertical; body covered with rough skin, slightly compressed in front, rounded behind, and increasing in depth with age; upper parts bluish-black, under silvery-white. In young *Sword-fish*, of twelve or eighteen inches long, the body is covered with little tubercles in longitudinal rows; these first subside on the back and afterwards on the belly, so that when the animal has acquired its full age they have entirely disappeared. It is very common in the Mediterranean. It is found occasionally on the Spanish and French coasts, and sometimes on our own; it even enters our rivers, of which an instance is mentioned by Daniels, in his "Rural Sports," of one which, in the Severn, near Worcester, struck and killed a man who was bathing, the certainty of which was proved by the fish being captured almost immediately after. They attack with their long sword other fish, on which they are said to prey; but according to Bloch, they feed also on vegetable substances. It is no uncommon thing to find the broken beak of the *Sword-fish* sticking in a ship's bottom, which it may perhaps have mistaken for a Whale. In the Mediterranean they are fished for as articles of food from May to August. A man stationed on a rock gives notice of the approach of the fish, upon which the fishermen row towards and

endeavour to strike it with a small harpoon attached to a line, with which it makes away, and often requires many hours' pursuit before it can be got into the boat.

ZEUS—Doree. This genus is divided into two sections, or, not improperly, genera, viz., 1. *Doree* (Zeus); 2. *Boar-fish* (Capros).

The *Doree* (*Z. Faber*), figured on Plate 3, is from twelve to eighteen inches in length, and its greatest depth half as much; head large, mouth so extensile that, when projected, the hinder angle of the gill-flap is midway between its tip and the root of the rays of the tail-fin; the general colour of the fish is olive-brown tinged with yellow, assuming, in different lights, blue, gold, and white hues, but generally has a golden tinge, whence, perhaps, the origin of its name, from the French *Dorée*; upon each side of the body a large, circular, black spot, with a surrounding white ring; the fin membrane, between the spines, dark-brown, but lighter between the flexible rays. It is very common in the Mediterranean and in the Bay of Biscay, also along the Cornwall and Devonshire coast, and on that of Hampshire and Sussex. It has been taken both at Yarmouth and off the shores of Cumberland. In Ireland it is caught off Londonderry and Antrim, and along the Waterford coast. According to Couch, quoted by Yarrell, the *Doree* is rather a wandering than a migratory fish, its motions being chiefly regulated by the smaller fish on which it preys.

Other genera of this family:—

ATROPUS—The *Brama Atropus*, of Schneider.

CORYPHÆNA—*Dolphin*. Four subgenera; in general voracious.

GASTEROSTEUS—*Stickleback*. Two species found in our streams.

LAMPRIS—*King-fish*. Found in the Chinese seas.

MONOCEROS—*Sea Unicorn*. From two to three feet long.

RHYNCOBELLA. Three feet long; found in the Indian seas.

SCYRUS. From ten to fifteen inches in length; found off the Coromandel coast, also at Java and the Red Sea.

SERIOLA. An extensive genus; they all live in deep water.

STROMATEUS. A large genus; only one European species.

THUNNUS—Tunny. These fishes are found in both the Atlantic and Pacific Oceans, and also in the Mediterranean and Indian Seas, but it is disputed whether they are migratory, or, living in the depths of seas, merely approach the shores at breeding-time. Their flesh is much esteemed, and along the southern coasts of Europe and the islands of the Mediterranean afford extensive employment for fishers. Some of them were well known to the ancients, and as highly valued as at present.



Tunny.

TETRAPTURUS—Four-finned. Varies in length from four to nine feet; found in Sicily and off Sumatra.

THYRSITES, TRACHINOTUS, and VOMER.

TRICHIURUS—Hair-tail. This genus has great resemblance to the *Lepidopteri*, from which, however, they are distinguished by the absence of the scales representing the ventral fins, by the spines in place of anal fins, and by the entire want of a caudal fin, the tail itself tapering off to form a very delicate hair-like filament, whence its generic title.

The *Silvery Hair-tail* (*T. Lepturus*) is from two to three feet in length, and about one-sixteenth of this in depth, which it retains to the middle of the body, whence it begins to diminish, and the last fifth of the entire length resembles a narrow and compressed lash; the forehead and upper part of the muzzle are flat, and the sides of the head vertical; the eyes are placed rather behind the middle of the head, and the gape reaches back opposite their anterior margin. The general colour is very brilliant silvery; the fins yellowish-grey, and the edge of the dorsal dotted with blackish. This species is generally distributed throughout the Atlantic.

STYLEPHORUS. The single species known of this genus, *S. Chordatus*, is from ten to eleven inches in length exclusive of the caudal process, which is twenty-two inches more; the body is about two inches in depth and one in width; the colour is silvery; fins and caudal process brown. It has been once caught in the Gulf of Mexico, between Cuba and Martinique, near

a small cluster of little islands, swimming near the surface about nine leagues from shore. Of its habits nothing is known.

CEPOLA—*Band-fish*. This genus gets its name from the flesh separating in flakes like an onion.

The *Rubescens* *Band-fish* (*C. Rubescens*) is about two feet in length, though not so thick as one's finger, and of a reddish colour, and marked with some transverse irregular bands; the body is almost pellucid. It is a native of the Mediterranean.

Other genera of this family:—

BOGMARUS. Known to the Icelanders. **GYMNETRUS**. Found in the Mediterranean. **GYMNOGASTER**. Closely allied to *Bogmarus*. **LEPIDOPUS**. Found in the Mediterranean. **REGALECUS**. Allied to the *Gymnetrus*; known to the Norwegians; three species. **XIPHOTHECA**—*Scabbard-fish*. Rare on our coast.

AMPHACANTHURUS. A genus of fishes so called because of the sharp, moveable spine with which they are armed on each side of their tail, and with which they defend themselves against the assaults of larger fishes. If taken in the hand incautiously serious injuries may be the result. They are termed Doctors by English sailors, because of their strong and lancet-shaped spines. The teeth are trenchant and notched.

The illustrated species, *A. Guttatus*, is remarkable for the beautiful variety of its colours. They are found in the warm parts of both oceans.

Other genera of this family:—

PRIODON. One species known (*P. Annulatus*), two and a half inches long; teeth sharp and serrated; three short rays to the ventral fins. From Timor.

PRIONURUS. Nearly allied to the genus *Acanthurus*; teeth cutting and jagged on their edge like a saw; tail armed with rows of tooth-like plates.

ILLUSTRATIVE EXAMPLES.

PLATE 4.

Family—LABYRINTHIFORMIA.

The upper membranes of the pharynx in the members of this family are divided into leaves, small and irregular; between these there are cells which the animals can fill and empty at pleasure. When out of the water, they moisten their gills with the water contained in those cavities.

Genera.	Species.	Common Name.
Anabas - - - -	Testudineus - - - -	Climbing Perch.
Ophecephalus - - - -	Punctatus - - - -	Dotted Snake-head.

Family—MULETS; *Mugiloida*.

Mugil - - - -	Cephalus - - - -	Mullet.
---------------	------------------	---------

The Mullets are gregarious Fishes; at the mouths of rivers they may be seen in large troops. Their flesh is much esteemed.

Family—GOBIES; *Gobioida*.

The Goby family live in small troops among rocks near the coast; they can exist for some time out of the water; many of them are viviparous.

Blennius - - - -	Ocellaris - - - -	Butterfly-fish.
Anarrhicus - - - -	Lupus - - - -	Wolf-fish.
Gobius - - - -	Niger - - - -	Black Goby.

CHARACTERS OF THE GENERA.

1. **ANABAS** (Gr. ἀναβαίνω, to ascend). Head broad; muzzle obtuse; mouth small; lateral line interrupted at its posterior third; gill-covers denticulated; dorsal and anal fins having numerous spiny rays; body covered with scales.

2. **OPHICEPHALUS** (Gr. ὄφις, a snake, and κεφαλή, a head). Head and body covered with large polygonal scales; head depressed, obtuse, and short in front, the vertex covered with irregular scales; mouth wide; teeth rasp-like, and in a single row, with a few large and hooked ones scattered on the sides; gill-flaps smooth; dorsal fin single and very long; ventral below the pectoral fins.

1. **MUGIL**. Head flat, broad, depressed, covered with scales; lips fleshy and indented, the middle of the lower jaw forming a projecting angle, which is received into a depression within the upper; mouth toothless, except on the edges of the tongue; gill-flaps large; body nearly cylindrical; dorsal fins short, the first opposite the anal; pectorals not elongated; branchial membrane three-rayed.

1. **BLENNIUS** (Gr. βλέννα, mucus or slime). Ventral fins before pectoral, and composed generally of not less than two nor more than four rays; anal tubercle.

2. **ANARRHICAS**. General characters same as those of the Blenny, but without ventral fins.

3. **GOBIUS** (Gr. γοβίος, a Gudgeon). Ventral fins thoracic, united either throughout their whole length or at their root, forming a disc or sucker; spines of the dorsal fin flexible; body rather long; branchial opening narrow, and furnished with four rays: a little appendage behind the anus of the male.

LABYRINTHIFORMIA, MUGILOIDA, GOBIOIDA.—DESCRIPTION OF THE SPECIES.

ANABAS. So named by Cuvier because of their remarkable power of living for a considerable time out of the water. These fishes are covered with large scales, and by means of their fins, tail, and gill-covers, get upon land, and travel over a considerable space of ground; and one species, *A. Scandens*, or *A. Testudineus* (Plate 4), known at Tranquebar as the "Tree-climber," ascends palm and other trees. Their gills are adapted for retaining water, the pharyngeal apparatus being labyrinthiform, or divided into a number of irregular laminae, which form cavities for the retention of water, the evaporation of which proceeds but slowly. They are natives of India and the Indian Archipelago.



Respiratory Organs of Anabas.

OPHICEPHALUS. The disposition of the scales on the head of this genus resembling that of Snakes, has given rise to its name. It contains but two species—the *O. Striatus*, which sometimes attains the length of four feet, and the *O. Punctatus* (Plate 4), which measures from seven to eleven inches; its general colour dingy-white, studded with numerous black spots; the fins also tipped with black. From the rivers of the Indian Isles.

Other genera of this family:—*Polyacanthus*, *Many-spined*; *Spirobranchus*, *Spiral-gills*; *Trichonotus*, *Hairy-backed*; and *Trichopus*, *Hairy-footed*.

MUGIL—*Mullet*. There are seven species of this genus. The one figured is the *Common Mullet* (*M. Cephalus*), which sometimes acquires ten or twelve pounds in weight; the back brownish or bluish-black, the belly silvery, and striped longitudinally with eight narrow dusky streaks. It is very common in the Mediterranean and on the western coasts of the Atlantic, but rare in the British Channel.

Another genus of this family is *Tetragonurus*, a fish thirteen inches long, and found off the coast of Nice.

BLENNIUS—*Blenny*. This genus is remarkable for a viscid mucus, with which it is covered, and whence it has derived its name. The body is lengthened and compressed: there is generally but one dorsal fin, and both dorsal and ventral are made up of six slender rays. They live in shoals amongst the pebbles on the shore, swimming and leaping about. They are very tenacious of life for a long while after having been taken out of the water. The species, which are numerous, have been divided by Cuvier into five subgenera, viz., *Blennius proprius*, *Salarias*, *Clinus*, *Gunnellus*, and *Opistognathus*, principally from the arrangement of their teeth.

The *Butterfly Fish* (*B. Ocellaris*) is about six or eight inches long; head large; mouth wide and jaws furnished with a single row of straight

serrated teeth; eyes prominent, and above both a small process resembling a little ear; the operculum is composed of a single piece; the dorsal fin extends almost to the tail; the body has no scales; general colour greenish with irregular transverse bands of a dark olive; the dorsal fin also green with dusky blue and white spots, and from the fifth to the eighth ray of the same is a beautiful spot like an eye, black in the centre with a white margin, from which circumstance Ray named it Butterfly Fish. It inhabits the Mediterranean.

ANARRHICAS. This genus is nearly allied to the Blennies; the species have round, smooth, blunt heads; and their mouth is armed with conical incisors and flat grinders.

The *Wolf Fish* (*A. Lupus*), called also *Cat Fish*, and *Sea Cat*, is a ferocious and formidable animal; it measures six feet in length, feeds on Crustacea and Mollusca, and is good eating; it is of a light grey colour, marked with vertical bands of a bluish-grey. It frequently destroys the fishermen's nets, and when caught, defends itself with zeal to the last; and if the utmost care is not observed, it will inflict serious wounds on its captors by its powerful teeth and jaws.

Gobius—*Goby*. The fishes belonging to this genus are mostly of small size, with a lengthened body, the head moderately large, the cheeks prominent, and the eyes nearly approached to each other.

The *Black Goby* (*G. Niger*) is of slender form, and about six inches in length; the head large, and jaws armed with a double row of small teeth; colour deep olive, with darker streaks and spotted with black; ventral fins united, and forming a kind of funnel by which they fix themselves to the rock, whence the name of *Rockfish*. They are found in the Atlantic, on the British coasts, and the Asiatic seas.

Other genera of this family:—

CALLIONYMUS—*Dragonet*. Destitute of an air-bladder; head much larger than the body; the principal species (*Yellow Gurnard*) is from ten to twelve inches long.

PERIOPHTHALMUS. Lower lid of eye moveable; from eight to twelve inches long.

SALARIAS. Distinguished from the Blennies by their very small, fine teeth; three species are named.

SICYDION. Approximates to the family Gobius.

ZOARCHUS. Nearly allied to the Blennies.

ILLUSTRATIVE EXAMPLES.

PLATE 5.

Family—ANGLERS; *Pectoralipeda*.

The family Pectoralipeda consists of two genera remarkable for the peculiar structure of their fins, by which they are able to leap out of the water when in pursuit of their prey; some of them also leap over mud like frogs.

Genera.	Species.	Common Name.
Lophius - - -	Piscatorias - - -	Common Angler.
Batrachus - - -	Surinamensis - - -	Surinam Toad-fish.

Family—WRASSES; *Labroida*.

The family Labroida are characterised by their thick lips, oblong scaly body, and thickly-set gills.

Labrus - - -	Carneus - - -	Red Wrasse.
Scarus - - -	Creticus - - -	Cretan Scarus.

Family—PIPE-FISH; *Aulostomata*.

A long tube projects from the cranium of the Pipe-fish family, which consists of two genera.

Fistularia - - -	Tabacaria - - -	Tobacco-pipe Fish.
Centriscus - - -	Scolopax - - -	Sea Woodcock.

CHARACTERS OF THE GENERA.

1. **LOPHIUS** (*Gr. λοφία, a neck provided with bristles erect like a cock's comb*). See Description of the Species.

2. **BATRACHUS** (*Gr. βάτραχος, a Frog*). Head flattened horizontally,

larger than the body; ventral fins straight attached under the throat; first dorsal fin short, supported by three spinous rays; second dorsal long and soft, opposite to which the anal fin, also soft; mouth and gills very large; gill-flaps spined; lips sometimes bearded.

1. **LABRUS** (*Lat. labrum, a lip*). Form oblong; lips fleshy, double, one of them attached to the jaws, the other to the sub-orbital bones; gills five-rayed, serrated; maxillary teeth conical, the middle and anterior longest; pharyngeal teeth cylindrical and blunt, disposed on two broad plates above and one below; pores on the head in many instances; the tail round or forked.

2. **SCARUS** (*Gr. σκαίρω, I leap*). Jaws composed of the intermaxillary and præmandibular bones, convex, rounded, and furnished with teeth, disposed like scales on their edge and anterior surface, and moving in succession from behind forwards; pharyngeal teeth disposed on two plates in the upper, and on one in the lower jaw, in some species merely transverse laminae, in others pavement-like; lips fleshy; body covered with large scales; lateral line uninterrupted.

1. **FISTULARIA.** Head long and projecting like a tube, forming a third or fourth of the whole length of the body; the jaws placed at its tip; opening of the mouth narrow, and nearly horizontal; body very long and slender; six or seven rays to the gills; bony appendages extending backwards from the head on to the body; dorsal fin opposite the anal.

2. **CENTRISCUS** (*Gr. κέντρον, a prick*). Muzzle tubular; body oval or oblong, compressed laterally and sharp below; gills composed of two or three small rays; first dorsal fin spiny; ventral small and behind the pectoral; mouth very small, placed obliquely and wanting teeth.

PECTORALIPEDA, LABROIDA, AULOSTOMATA.—DESCRIPTION OF THE SPECIES.

LOPHIUS—*Angler*. The *Common Angler* (*L. Piscatorius*) is from four to five feet in length, and having some resemblance in shape to a paper kite; the larger part being formed by the head and the bones supporting the pectoral fins, behind which the body tapers towards the tail; it has a very hideous aspect, its wide mouth opening upwards, and closely beset with strong teeth; immediately behind the head stand out laterally the broad, expanded, pectoral fins, which are very remarkable on account of their moving upon two bones, which have a very close resemblance to the fore arm of the higher classes of the *Vertebrata*; the ventral fins are placed beneath the throat, are strong, and serve the purpose of trailing the fish along the bottom of the sea; the long spines upon the top of the head and front of the back are believed to serve the purpose of snares, or rather baits, to assist the fish in obtaining its prey; the four hindmost of these, which have some little membranous expansion at their root, are considered by Cuvier as answering to the first dorsal fin. The external opening of the gills is single, and of a semilunar shape, and placed beneath the root of the pectoral fins. Within the mouth, near the gills, on each side, is a large cavity resembling the cheek pouches of several of the *Mammalia*, and formed by the skin passing loosely from the bony apparatus of the head and tongue to the arm-like piece of the pectoral fins; in these cavities, not unfrequently, are found dog-fish or haddocks, which, the Angler's appetite having been appeased, it stores up to satisfy its future craving.

As the Angler, from his unwieldiness, is not a good swimmer, and therefore is unable to overtake its agile prey, it has recourse to stratagem: hiding itself in the sand or mud among the marine plants, with its enormous mouth widely extended, it moves about the long spines on its head and back, which attract to the spot other fish in search of food, and these, when within its reach, are snapped up by the Angler, whose mouth serves it instead of a casting-net.

The Angler was known to the ancients; Aristotle speaks of it by the name *βάρπαχος*; the Latins called it *Rana Marina*.

BATRACHUS—*Frog Fish*. This genus is named from the immense size of the head, resembling that of the Frog. The species of which it is composed inhabit the southern hemisphere, and lie in ambush in the sand for

the purpose of catching those fish on which they prey. They may be separated into two divisions; 1, those with beards (Cirrhi), and 2, those without beards on their lips.

The illustrated species, the *Surinam Frog*, or *Toad Fish* (Plate 5), belongs to the latter division. It is about sixteen inches long; mouth smooth; anterior dorsal fin having three spines; ventral having nine rays, rounded; scales oblong; vent nearer the head; lateral line straight. It inhabits Surinam.

LABRUS. The numerous individuals composing this genus are very generally distributed, some in the northern and others in the southern seas. They are divided into several subgenera.

Plate 5 contains an illustration of one species, the *Flesh-coloured Bergil*, or *Red Wrasse* (L. *Carneus*). It is destitute of pores on the head; its body is red, with three large black spots on each side; dorsal, anal, and caudal fins edged with blue.

SCARUS—Parrot Fish. The fishes forming this genus are usually known by the name of *Parrot Fish*, on account of the form of their jaws and the brilliancy of their colours. They are principally natives of the tropical seas.

The species *S. Cretensis*, or *Cretan Scarus*, is about thirteen inches in length, the forehead depressed; dorsal fin low, commencing immediately behind the head, and extending along nearly the whole length of the back; tail crescent-shaped. According to Aldrovandi, the general colour of the fish is greenish-yellow above, and the head and sides dusky-green; but Cuvier says it is blue or red, varying with the season. It is taken off the shores of Crete, and being pickled with the entrails undisturbed is used as food by the natives. Cuvier considers it to be the *Scarus* of the ancients, and by them esteemed as a great luxury.

Other genera of this family:—

LABRAX, a very voracious fish, found in the seas of Kamtschatka.

NOVACULÆ and XIRICHTHYS—Razor Fish. Both allied to the *Labri*.

FISTULARIA. The true *Fistulariæ* have but one dorsal fin, composed of single rays, as is also the anal; and from between the two portions of the caudal fin extends a thread often as long as the body; the mouth is furnished with small teeth; the tube long and flattened. Among these may be enumerated—the *Tobacco-pipe Fish* (F. *Tabaccaria*), figured on Plate 5; the *F. Serrata*, and the *F. Immaculata*.

CENTRISCUS—Trumpet Fish. The *Sea Woodcock* (C. *Scolopax*) is about four inches in length; has the first dorsal fin situated very far back, the first spine of which is very long and strong, and attached by the cuirass to head and shoulders; the muzzle very long and slender, so as to give it the appearance of a Woodcock's bill or the nozzle of a pair of bellows; the general colour of the fish is a delicate red; it is covered with small scales, but has some larger serrated scales on the back. Native of the Mediterranean, and sold in the markets of Italy, where it is considered a dainty.

ORDER II.—HETRO-MALACOPTERYGIA. ABDOMINAL SOFT-FINS.

THE Order Malacopterygii (Jointed-fin Fishes) comprises fishes which have ventral fins suspended to the abdomen, behind the pectorals, and unattached to the shoulder-bones. They are the most numerous order of the Class Pisces, including a large portion of fresh-water Fishes.

ILLUSTRATIVE EXAMPLES.

PLATE 6.

Family—CARPS; Cyprinoida.

The Cyprinoida have shallow mouths, feeble jaws, sometimes without teeth, pharynx toothed, and scaly body.

Genera.	Species.	Common Name.
Cyprinus	- - - Carpio	- - - Carp.
Cobitis	- - - Fossilis	- - - Muddy Loach.
Anableps	- - - Tetrophthalmus	- - - Four-eye.

Family—PIKES; Esocida.

The members of the Pike family are characterised for their voracity; all of them are provided with an air-bladder; and they are destitute of an adipose dorsal fin.

Genera.	Species.	Common Name.
Esox	- - - Lucius	- - - Pike.
Exocoetus	- - - Exiliens	- - - Flying-fish.

Family—SHEET-FISH; Siluroidea.

The Silures have no scales; their skin is either naked or covered with large bony plates; they have a large air-bladder, and a strong articulated spine.

Silurus	- - - Glanis	- - - Sheet-fish.
Pimelodes	- - - Cyclopus.	
Loricaria	- - - Cirrhosa.	

CHARACTERS OF THE GENERA.

1. **CYPRINUS** (Gr. *κυπρινος*). Mouth small, jaws without teeth; three flat rays to each gill; large teeth on the pharynx; one dorsal fin; body covered with scales.

2. **COBITUS** (Gr. *κοβιός*, *gobius*, a Gudgeon). Head small; body lengthened, almost of an equal thickness, and covered with small scales; mouth, small, placed underneath the tip of the muzzle, without teeth, and provided with lips fit for sucking, and with cirrhi; gill openings very small, the gills having only three rays; the ventral fins placed far back, and above them a very small dorsal fin.

3. **ANABLEPS**. Two openings to each eye; eyes prominent, placed under a sort of roof formed by the side of the frontal; characters in other respects like the genus *Cobitis*.

1. **ESOX**. Head flattened; upper jaw shorter than lower; mouth and throat wide; jaws, tongue, and branchial arches furnished with fine and sharp teeth; operculum and branchial orifice very large; body and tail long, compressed laterally, and covered with hard scales; no adipose, and only one dorsal fin placed opposite the anal, both of which are near the tail.

2. **EXOCÆTUS** (Gr. *ἐξω*, *extra*, and *κοίτη*, *cubile*, so named from an opinion given by Pliny, that it left the water to sleep ashore). Head almost entirely covered with minute scales, and flattened both vertically and laterally; each jaw armed with small pointed teeth, and molar teeth in the throat; pectoral fins very broad, and long enough to reach the tail, which is forked; single dorsal fin opposite the anal.

1. **SILURUS** (Gr. *σειώ*, *I shake*, and *οὐρά*, *a tail*). Head large, naked, broad, and depressed; mouth at the extremity of the muzzle, and furnished with teeth, either in a single or in several rows; jaws furnished with bar-bules, varying from four to eight; lips thick; eyes small, and in some species almost imperceptible; body compressed, scaleless, and freely lubricated with mucus; dorsal fin short and single; anal fin very long, and nearly reaching the tail.

2. **PIMELODUS** (Gr. *πυμελή*, *fat*). General characteristics nearly the same as those of *Silurus*.

3. **LORICARIA** (Lat. *lorica*, a coat of mail). Head and body covered with hard, angular scales; mouth placed beneath the muzzle, small, lips thin; intermaxillaries small; maxillaries transverse, ununited, furnished with long, delicate, flexible teeth, hooked at the point; those in the throat blunt; true opercules immoveable, their place supplied by two small, external plates; branchial membrane bearing four rays; the first rays of the dorsal, pectoral, and ventral fins, are strong spines.

CYPRINOIDA, ESOCIDA, SILUROIDA.—DESCRIPTION OF THE SPECIES.

CYPRINUS—Carp. The Carps form a large, but not very interesting genus; they live in fresh water, and, as the structure of their teeth would prove, principally upon vegetable substances. They have been divided into the following subgenera:—1. Carps; 2. Barbels; 3. Gudgeons;

4. Tench; 5. Cirrhines; 6. Breams; 7. Labeons; 8. White Fish; and 9. Gonorhynques.

The *Carp* (*C. Carpio*), a species of the first subgenus, is figured on Plate 6. This fish is of a thick shape; it is of an olive-green colour above, and golden beneath; the lips thick; the angles of the upper jaw are furnished with two beards on each side, of which the lower are the shorter; the dorsal fin extends far towards the tail, which is slightly bifurcated; the scales are very large. The *Carp* sometimes weighs as



The Dorsal Fin.

much as twenty pounds, and reaches from four to five feet in length. It is extremely tenacious of life, even when taken from the water.

COBITIS—Loach. There are but three species in this genus, and they are all fresh-water fish; they are the *Groundling* (*C. Barbatula*); the *Spiny Loach* (*C. Tænia*); and the *Great or Muddy Loach* (*C. Fossilis*), figured on Plate 6.

ANABLEPS. Head flat; snout blunt; mouth wide, armed with small teeth; body cylindrical, and covered with strong scales; gill-rays five; no peduncle to the intermaxillaries, which are suspended to the nasal bones; pectorals in part scaly; dorsal small, and near the tail; air-bladder large; intestine wide, without cæca.

The species *Four-eyed* (*A. Tetraphthalmus*), which inhabits the rivers of Guiana, is the only species known. The cornea and iris are divided by transverse bands, which give the animal the appearance of having four eyes, whereas it has, in reality, only two. The two openings referred to above affect not the singleness of the eye in this animal. The female produces her young alive, and in an advanced state.

Other genera of this family:—Cyprinodon; Pœcilia.

ESOX—Pike. The *Pike* or *Pickerel* (*E. Lucius*), when in condition, is of a green colour, spotted with bright yellow, and the gills of a bright red; but when out of season, the green becomes grey, and the yellow spots paler. It sometimes acquires the length of eight feet in Lapland, but the largest ever caught in England



The Pike.

weighed thirty-five pounds. The pike is extremely voracious, and may be considered as the fresh-water Shark. They are often known to be destroyed by attempting to gorge one of their own species larger than their swallow will admit; and Mr. Plott, of Oxford, has appended a note to Plott's "History of Staffordshire," in which it is related, that a Swan, whilst feeding under water, had her head gorged by a pike, and both were destroyed. It appears to be as terrific to the small fish as the Hawk or Owl is to birds, and when asleep the lesser fish may be seen swimming round them in great numbers, and with much anxiety. Pikes live to a very great age: Rzaczynski, in his "Natural History of Poland," mentions one of ninety years old; but this is far exceeded by Gesner's account of a Pike taken near Hailbrun, in Suabia, in the year 1497, which bore a ring with a Greek inscription to the following purport, "I am the fish which was first of all put into this lake by the hands of the governor of the universe, Frederick (Barbarossa) the Second, the 5th of October 1230." Its skeleton was kept for many years at Mannheim. Pikes spawn in March or April. They are used for the table, and by some persons considered good eating. They are common in most of the European lakes, and in the north of Persia, but the largest are taken in Lapland.

EXOCEtus—Flying Fish. The fish belonging to this genus have the power of supporting themselves upon their pectoral fins, in a flight out of water, more completely than the Gurnards and others. Pursued by the *Coryphæni* and other voracious fishes, the defenceless Flying Fish is compelled to quit its native element, whence it has no sooner emerged than fresh dangers await it from the ravenous Gulls and Frigate Birds, which are attracted to their prey by the shining hue of their victim glittering beneath the surface of the sea; so that it may be truly said, in avoiding Scylla the poor little wretch falls into Charybdis. The Flying Fish is

not able to support itself long out of water, as the air soon dries its fins, and it is again compelled to seek its native element, where its insatiate enemy is ready to seize it, as soon as it descends.

Four species are described, one of which, the *E. Exiliens*, is figured on Plate 6.

Other genera of this family:—Mormyrus; Salanx.

SILURUS. The fishes composing this genus are found principally in Asia, Africa, and America, living in ponds, tanks, and rivers. Northern Europe produces but one species, and it is curious that they are not found either in England or Jamaica. They are slow-moving fish, are predaceous, and do not hunt, but lie in ambush for their prey, hidden either in the mud, or in their holes, and playing the barbules on their heads till unwary fish come within their reach, when they spring upon them. Their large, rounded head is supposed to give them the appearance of Whales, and hence some of them have been called River Whales. This resemblance is so great in the American species, that Agassiz has thought proper to form them into a new genus, by the name of *Cetopsis*.

The *Sheet Fish*, or *Sly Silurus* (*S. Glanis*), is the largest of the fresh-water fishes of Europe, sometimes attaining the length of six feet, or even more, and weighing as much as three hundred pounds: head shovel-shaped, and of a deep green colour, having six barbules; mouth very large, lower jaw projects beyond the upper; nostrils round, situated between the two long barbules, and behind them are the eyes, small, and having the pupils black, and the irides white; the body is thick and long; the back and sides above the lateral line greenish-black, and below it pale green, the whole body studded with irregular blackish spots; belly yellowish-white; the dorsal fin has five rays, is of a yellowish colour, with a blue tip, so also are marked the ventral fins, which have thirteen rays; pectoral fins furnished with eighteen rays, at their base and tips bluish, and in the middle yellow; their first ray is strong, bony, and denticulated within; anal fin supported by fifty rays, yellowish-grey at the base, and tipped with violet, as is also the caudal fin. This fish is found in all quarters of the globe, most commonly in fresh, and but rarely in salt water.

PIMELODES. These were removed by Lacepède from the genus *Silurus*; and from the great variety they exhibit are very difficult to arrange under any one genus. Cuvier has divided them into four subdivisions; viz., *Bagres*, *True Pimelodes*, *Synodons*, and *Ageneioses*.

The species *P. Cyclopus* (Plate 6) is found generally about four inches long, but some varieties do not exceed two inches; the body is depressed, of an olive colour, and marked with little black spots; mouth at the extremity of the muzzle, very wide, and furnished with only two beards attached to the jaws; eyes very small, and placed in the middle of the head; skin of the body and tail copiously besmeared with mucus. It is found in lakes seventeen hundred toises above the level of the sea, in the kingdom of Quito, and is the only fish there found above fourteen hundred toises. It is called *Prenadilla* by the natives, and is remarkable for being continually ejected from the craters and clefts of the volcanoes of Imbaburu, Sangay, Cotopaxi, Tungaragua, and Cargueirazo.

LORICARIA. These fish are natives of South America.

Other genera of this family:—Aspredo; Malapterus.

The latter fish can communicate an electric shock like the Torpedo and Gymnotus. It is found in the Nile, and in the rivers of Central Africa.



Malapterus.

ILLUSTRATIVE EXAMPLES.

PLATE 7.

Family—SALMONS; *Salmonida*.

The Salmon family is characterised by a scaly body; they include the Salmon and Trout. They are divided into two sections, namely, Migratory and Stationary.

Genera.	Species.	Common Name.
Salmo - - - -	Salar - - - -	Salmon.
Argentina - - - -	Sphyræna - - - -	Argentine.
Saurus - - - -	Fœtens - - - -	Fetid Saury.

Family—HERRINGS; *Clupeida*.

Clupea - - - -	Harengus - - - -	Herring.
Gnathobolus - - - -	Aculeatus.	
Porypterus - - - -	Bichir.	

CHARACTERS OF THE GENERA.

1. SALMO (Lat. *salio*, I leap). Head smooth; mouth large; teeth conical, pointed, arming all the bones of the mouth, also the tongue and branchial arches; branchial rays ten or twelve; body lengthy; pectoral and ventral fins of moderate size, the latter on middle of the belly, opposite the true dorsal fin, and along their base a fleshy fringe; opposite the anal a spurious dorsal fin, consisting only of fat enveloped in skin; caudal fin attached to a very fleshy root.

2. ARGENTINE. Mouth small, and toothless; strong-hooked teeth on tongue; small teeth before the vomer; gill-rays six.

3. SAURUS (Gr. *σαύρα*, a fish so called). Generic characters nearly the same as Salmo. See also "Description of Species."

1. CLUPEA. Intermaxillary bones short and narrow; sides of jaw made up of the superior maxillary bones; gills very large, and the anterior portions of the branchiæ towards the mouth set with fine long teeth like those of a comb; body narrow and carinated below, at which part the scales are disposed like saw teeth.

2. GNATHOBOLUS (Gr. *γνάθος*, a jaw, and *βάλλω*, to cast). Mouth vertical, closed by raising the lower jaw, opened by depressing it; at which time is protruded from the upper jaw a slightly-arched short lamina, which, when the mouth is closed, recedes and rests upon the gill-covers; gill-covers scaly in front, transparent posteriorly and resplendent; head, body, and tail compressed; thorax carinated and armed with eight spines, as is also the abdomen with a double row of twenty-eight; dorsal fin small, and placed far back; anal long, and reaching to near the root of the tail; no ventrals.

3. PORYPTERUS. Head covered with sharp bony plates; sides of upper jaw immoveable; teeth like a rasp, with long ones in front; body covered with scales; one gill-ray; separate fins on back; stomach large; double air-bladder, with large lobes, the left one opening freely into the gullet.

SALMONIDA, CLUPEIDA.—DESCRIPTION OF THE SPECIES.

SALMO—*Salmon*. The individuals composing this genus—Salmon and Trout—are extremely voracious, and feed on living prey, which consists of small fish, both of their own and other species, on aquatic insects and their larvæ, worms, small crustaceous animals, and the eggs of some Echinodermata. They are found in the temperate and northern parts of Europe, Asia, and America, but seem to prefer the colder streams.

All the species are extremely active in their motions, and some traverse considerable distances in the performance of certain of their animal functions. According to the observations of M. Agassiz, the seasons have considerable influence on the colours of the individuals forming this genus, which vary so much at different times as to give rise to great difficulty in defining the species. The peculiar kind of food on which they live is another cause of the variety of colour among the same species.

Some of the genus are considered to be sea fish, though they cannot be strictly so called, since they are spawned in fresh water, and only visit the sea periodically for a short time; indeed, some even of these remain con-

stantly in rivers, being there confined accidentally. But that their annual visit to the ocean is of importance to their economy, is proved by the fact that fish so restrained do not thrive or acquire their usual size. Others, however, are naturally located in rivers and pools of fresh running water which they never leave, and are therefore strictly fresh-water fish. They are all edible fish, generally of high flavour, and highly esteemed. The Salmon especially is most valuable, both on account of the large quantity of excellent food afforded by it, and the great number of persons engaged in its capture.

They are usually divided into two sections, the migratory or sea fish, which annually visit the sea for a few months; and the stationary or river fish, which always continue in the fresh water; but, as to structure and general character, there does not appear to be any material difference.

The Illustrated Species (*S. Salar*), the *Salmon*, belongs to the Migratory Section. The length of the head is one-fifth of the total length of the animal; its dorsal surface is grey or bluish-black, inclining to a lighter tint on the sides; it is sometimes spotted with black, more especially in the females, and at other times plain; the belly silvery; the dorsal, pectoral, and caudal fins blackish, the fatty fin corresponding to that part of the back on which it is placed; ventral fins white on their outer, and more or less dusky on their inner surface; anal white.

During the summer months, Salmon are found in immense numbers along the coast and at the estuaries of rivers, in which they rest a longer or shorter time without any apparent reason, moving up and down with the tide before they commence their regular ascent of the stream. The reason of the entrance of Salmon into rivers seems to be for the purpose of spawning; and their stay at the estuaries, with frequent returns to the sea, appears sufficiently accounted for by the necessity there is for the animal's constitution being gradually accommodated to the great change it is about to undergo in passing from salt water to fresh. This would seem also to be proved by the fact that the fry and the fish which have spawned, when about to return to sea, always remain for some time in the estuaries before they proceed to the ocean.

About the middle of August the milt and roe, which in May had been about as large as the finger, begin to swell rapidly, and towards the end of the month have attained such size as materially to diminish the quality of the fish; for, as they increase, the walls of the belly, which had previously been thick, lose the fat which had been deposited there in large quantities, and to such extent that little more than the skin alone is left. From this time (August) the male fish is called a *Kipper*, and the female a *Baggit*. When the fish have attained this condition, they begin to ascend the rivers, and continue so to do through September and October, by which time they generally reach the spawning-ground. The Salmon in its ascent continues its course along the banks of the rivers, preferring the shallow water, and making its way over mill-dams, weirs, and up cataracts with persevering resolution, often for hundreds of miles, till it has reached the proper locality. During its residence in fresh water, the fish undergoes a considerable change in appearance, the male becoming striped on the cheek, with orange-coloured marks like a *Labrus*, and the body assuming a golden-orange tint, from which circumstance they are called *Red-fish*; whilst the females, becoming very dark, are called *Black-fish*. The flesh also loses colour and becomes paler. For spawning they select shallow running water at the top and foot of fords, where the bottom is fine and gravelly, or low down in pools where the water begins to run, which assists them in moving the gravel.

The business of spawning occupies some time, as the fish are only engaged in it early in the morning or at evening twilight. They go in pairs, and after playing about the ground begin to make furrows, working up the gravel against the stream for a distance of about twelve feet; into this furrow they both deposit the spawn, and as it drops the gravel is turned over it by the male with his tail. Having reached the extremity of the furrow, they sweep round to the point at which they had commenced, and passing along its side form a second, which is in like manner filled with spawn, and this process is repeated till a bed of eight or ten feet in width is produced. The ova or eggs are at first about the size of mustard

seed, but when about to be dropped are as large as field peas, and the average number contained in the roe is from 18,000 to 20,000, but instances have occurred in which as many as 26,000 have been found. If during spawning time the male is destroyed, the female returns to deep water and selects another mate, after which she returns and completes the exclusion of the eggs. In about three or four months the *fry* begin to rise from the gravel beds; but they keep in the eddy pools till they acquire strength for their further movements, and then, being from two to three inches in length, and from half an ounce to an ounce in weight, they are called *Smouts*. They descend along the margin of the stream, as being easy water, till they reach the tideway, when they leave the banks and run into the deep water, where they are least disturbed by the action of the tide, and are most free from observation. Here they remain for two or three days, and then go off to sea.

The growth of the fry, whilst remaining in salt water, is very rapid, as, when they return to the rivers about the middle of June, they weigh from two to three pounds. Their growth, whilst on the coast and at the estuaries, is very rapid; and, according to Mr. Little's observations, during the whole period of the fishery they continue increasing steadily at about half a pound a week, so that by the end of August, which is the height of the Grilse season in the Tweed, they weigh from six to eight pounds. In September they become scarce, and it is believed drop down to the sea, from which they return in the following year as perfect Salmon of eight or nine pounds weight.

As to the mode in which Salmon leap up the falls, Agassiz says: "This elastic tail is to these fishes a most powerful lever; when wishing to leap to a great height, they strike the surface of the water with a kind of double stroke."

Salmon is, as is well known, a very important article of food, but is not at all times in season. The fish which have just come up from the sea are considered to be in finest condition; they do not deteriorate for the first twenty-four hours, but after that time gradually decline in flavour and appearance.

ARGENTINE. The individuals composing this genus are found in the Mediterranean Sea. The only known species is that figured on Plate 7; viz., the *Argentine* (*A. Sphyræna*), the digestive organs of which are like those of a Trout; the air-bladder is thick and much loaded with *nacre*—the silvery substance used in counterfeiting pearls.

SAURUS—*Saury*. This is one of the genera into which the Linnæan genus *Salmo* has been divided by modern zoologists. It is distinguished from the *True Salmons* by the edge of its upper jaw being formed entirely of the intermaxillary bones, and by not having any teeth in the vomer; from the *Smelts*, which have only eight rays in their branchial membrane; and from the *Lavarets* and *Argentines*, which have no teeth in the jaws. Some are met with in the Mediterranean, but the greater number in the Indian Seas and on the coast of Brazil. They are very predaceous. There are about sixteen species.

The figured species, the *Fetid Saury* (*S. Fœtens*), is about twelve or fourteen inches in length, and of a slender form; head truncated; mouth wide; nostrils round, single, and near the eyes, which are high up, and separated from each other by a groove; pectoral fins short; anal long; rays of all the fins flexible and ramified; back blackish; sides and belly silvery; fins reddish-brown. It is caught on the coast of Carolina, where it is called the *Sea Sparrow Hawk*, but is not common.

Other genera of this family:—*Gasteropelecus*, *Hatchet-belly*; *Serrasalmo*, *Serrated Salmon*; *Sternoptyx*, *Folded-chest*; *Tetragonopterus*, *Quadrangular-fins*; and *Thymallus*, *Grayling*.

CLUPEA—*Herring*. This genus has been divided into several subgenera: viz., 1. *Herrings proper*; 2. *Megalops*; 3. *Anchovies*; 4. *Thrissa*; and 5. *Notopterus*.

The *Herring* (*C. Harengus*)—the Herring of commerce—is about ten inches in length, the back of a greenish colour, thick; the belly of a silver hue, narrow and sharp, and the scales, as they meet each other at its edge,

forming an irregular surface like the teeth of a saw; head small, lower jaw the longer of the two; sixteen or seventeen rays to the anal fin. They are found in the highest northern latitudes, and generally as low down as the northern coasts of France; in one instance they have been caught in the Bay of Tangier, but never more southward.

The most remarkable circumstance in the natural history of the Herring, is its annual migration from the Arctic circle towards the south, as it is presumed for the purpose of depositing its spawn, after which it returns to its winter habitation, where its food, water-insects and mollusca, are more plentiful. The term Herring is derived from the German word *Heer*, an army; and if reference be made to the habits of the fish, no term could probably have been found more apposite; for the numbers in which they make their appearance is beyond calculation, and their motions are so regular, that they would almost seem to be directed in their course by some experienced guide.

Herrings are in full roe towards the end of June, and continue in perfection to the beginning of winter, when they begin to deposit their spawn. The young Herrings make their appearance in shore in July and August, being then from half an inch to an inch in length; at which time they are called in Yorkshire *Herring Sile*. What becomes of the Herrings in winter is not well known; it is certain, however, that the young are not taken during that season, whilst the old Herrings are constantly caught all the year round by the fishermen on the coast.

GNATHOBOLUS. But one species of this genus is known, *G. Spinifer*, or *G. Aculeatus* (Plate 7). It is remarkable for its fine silvery hue, and hence called by the French colonists of Cayenne the *Sardine*, of which fish, properly so called, it is a rival in the estimation of gourmands.

PORYPTERUS. These fishes are eatable: they are found in the African rivers.

Other genera of this family:—*Chirocentrus*, *Elops*, *Erythrinus*, *Lepisosteus*, *Notopterus*, *Polypterus*, *Pristigaster*, *Thryssa*, and *Ludis*.

ORDER III.—LÆMO-MALACOPTERYGIA. THROAT-SOFT FINS.

THE families of this Order have the ventrals under the pectorals, and the pelvis is suspended to the shoulder-bones.

ILLUSTRATIVE EXAMPLES.

PLATE 8.

Family—COD; *Gadoida*.

In the Cod family the ventrals, which are pointed, are inserted under the throat.

Genera.	Species.	Common Name.
<i>Gadus</i> - - -	<i>Morrhua</i> - - -	Cod-fish.
<i>Phycis</i> - - -	<i>Mediterraneus</i> - - -	Mediterranean Fork-beard.

Family—FLAT-FISH; *Pleuronectoida*.

The Flat-fish family have a most unsymmetrical head; their eyes are on one side, which side is uppermost when they are swimming.

<i>Platessa</i> - - -	<i>Vulgaris</i> - - -	Plaice.
<i>Rhombus</i> - - -	<i>Megastoma</i> - - -	Whiff.
<i>Solea</i> - - -	<i>Vulgaris</i> - - -	Sole.

Family—SUCKERS; *Discobolida*.

The characteristic of the family *Discobolida* consists in the disc being formed by the ventrals.

<i>Lepidogaster</i> - -	<i>Cornubiensis</i> - - -	Cornish Sucker.
<i>Echeneis</i> - - -	<i>Remora</i> - - -	Common Remora.

CHARACTERS OF THE GENERA.

1. *GADUS*. Scales and fins soft; seven round rays to the gills, which are large; ventral fins attached under the throat, pointed.

2. *PHYCIS* (Gr. *φύκις*, a fish, so called from being supposed to live among sea-weed). Pectoral beards short; body longish and compressed; second dorsal fin generally as long as the first; anal fins two; ventrals supported by a single ray, often bifurcated at its tip.

1. *PLATESSA* (Gr. *πλατὺς*, broad). Dorsal fin not extending further forward than the upper eye, and as well as the anal fin separated by a gap from the caudal; in some the jaws are furnished with obtuse cutting teeth, and the throat with teeth like paving-stones, in others the teeth of the jaws are sharp, and those of the throat strong and pointed; eyes generally on the right side; body rhomboidal.

2. *RHOMBUS* (Gr. *ῥόμβος*, a rhomb, to which geometrical figure these fish have a resemblance). Eyes mostly on the left side; delicate teeth on the jaws and in the pharynx; body compressed, deep vertically; dorsal fin commencing near the edge of the upper jaw, and extending nearly to the tail; anal fin commencing almost immediately behind the ventrals, and nearly reaching the tail.

3. *SOLEA* (Lat. *solum*, the sole of a shoe). Both eyes and dark colour on the right side; mouth distorted to the left, on which side the head is generally covered with cirrhi of greater or less length; muzzle rounded, and the upper jaw projecting more or less beyond the lower; both jaws furnished with delicate velvet-like teeth on the left side, but not on the right; body oblong; dorsal and anal fins extending to or nearly to the tail; in some species the pectoral fins extremely small.

1. *LEPADOGASTER* (Gr. *λεπίς*, a shell, and *γαστήρ*, the belly). Pectoral fins double, the anterior and outer larger than the inner; ventrals also double, connected by membrane at their base, so as to form a saucer-like hollow; both pectoral and ventral fins connected by membrane with each other; dorsal and anal fins single; body scaleless and smooth; head depressed, sometimes cirrhat; mouth prominent and extensile; branchial rays four or five.

2. *ECHENEIS* (Gr. *ἔχειν*, to hold, and *ναῦς*, a ship). Head surmounted with a flat disc, composed of several pairs of moveable plates; mouth roundish, horizontal, lower jaw projecting, and furnished, as well as the front of the upper jaw, with small teeth, set close, like a wool-card, whilst those on the sides of the upper jaw are very fine, and ranged in a single row; eyes lateral; branchiostegous rays eight; body longish, the dorsal fin single, soft, and opposite the anal.

GADOIDA, PLEURONECTOIDA, DISCOBOLIDA.—DESCRIPTION OF THE SPECIES.

GADOIDA—*Cod*. This important genus has the body tapering, and slightly compressed; the head smooth and not scaly; the jaws are furnished with rows of teeth, and besides these a pair of processes on the front of the vomer are covered with numerous sharp-pointed teeth, with their points directed backwards; the dorsal fins are generally either two or three, but sometimes running into each other, so as to form a single fin. These fish are furnished with a large air-bladder, which is commonly known as the *Sound*. The structure of their teeth indicates their predatory habits, and they are accordingly found living upon worms or small fish of their own or other kinds. They form an important article of commerce, more especially when dried. They are divided into subgenera from the number of their dorsal fins, viz.—1. *Cods*; 2. *Whitings*; 3. *Hakes*; 4. *Lings*; 5. *Rocklings*; 6. *Torsks*.

The *Common Cod-fish* (*G. Morrhua*) is from two to four feet in length, and weighs from fourteen to forty pounds. The larger fish are generally coarse, and those of moderate size are most esteemed for the table. As to colour, the back and fins are ashy, spotted with yellow, and the belly white; the lateral line straight, broad, and white to the vent, but becoming curved as it approaches the tail. Cod are most remarkably prolific; according to Lewenhoeck's patient examination, a middling-sized fish contains nine millions three hundred and eighty-four thousand eggs. The Cod is found only in the Northern Seas. The seasons for fishing are two: the first, or *shore season*, begins on the 20th of April, and ends on the 10th of October, when the boats fish in water from four to twenty fathoms; the second, or

bank season, begins in May and ends with September, when the boats fish in water from thirty to forty fathoms.

PHYCIS—*Fork-beard*. This genus is distinguished from the *Common Fork-beard* by its first dorsal fin being rounded, and not higher than the second; it measures from twelve to twenty inches in length, and is of a blackish-brown colour. It is found in the Mediterranean, and is considered good eating, and is common at Iviça, where it is called *Mollera*.

Other genera of this family:—*Lepidoleprus*, *Macrourus*, *Raniceps*.

PLATESSA—*Plaice*; *Flounder*. The individuals composing this genus have been divided into two sections, viz., 1. With the throat teeth blunt and ranged like a pavement; and 2. With the throat teeth strong and pointed.

The *Plaice* (*P. Vulgaris*) is about three times as long as it is in depth, and weighing from eight to nine pounds, and occasionally as much as fifteen pounds; between the eyes is a

row of six tubercles, extending back to the commencement of the lateral line; ocular side of the body clear brown, marked with bright orange spots, the other side white. The best are caught off the Sussex and Dutch coasts, although generally in the North Sea and in the Baltic. They feed on small fish, especially also on mussels and young cockles. They spawn early in February.



The Plaice.

RHOMBUS—*Turbot*, *Ray*. This genus, which formed part of the Linnæan *Pleuronectes*, till separated from it by Cuvier, is distinguished from the

Soles by not having the mouth twisted to one side, and from the *Flounders* by the great length of their dorsal fin. All of them are predaceous, feeding upon small fish, crustaceans and molluscan animals. They are divided into two sections from the position of their eyes and the form of their tail.



The Turbot.

The species named *Whiff* (*R. Cardina vel Megastoma*) is figured on Plate 8. This fish is of an oblong form, measuring eighteen inches in length by seven wide, and has some resemblance to the *Halibut*. It is covered with large rough scales, and has the lateral line very much curved at its origin, and after making a sharp angle runs straight on to the tail. The upper surface is ashy-brown marked with white and blackish spots; the under white tinged with red. It is caught in the British Channel.

SOLEA—*Sole*. This genus is distinguished from the *Plaice* (*Platessa*) by having no bony tubercles on the skin; from the *Halibuts* (*Hippoglossus*) by the small size of the teeth in its jaws; from the *Turbots* (*Rhombus*) by its eyes being on the right side, and the dorsal fin not commencing so far forward, and both it and the anal reaching to the tail; and from the *Achirus* by having pectoral fins.

The *Common Sole* (*S. Vulgaris*) varies from twelve to eighteen inches in length, and its greatest breadth not equal to half its length; length of the head half the breadth of the body; eyes small, the lower immediately above the corner of the mouth, their irides yellow; the rays simple, compressed, and covered with scales the greater part of their length; pectoral fins just behind the upper part of the branchial opening, narrow, rounded, and their middle rays longest; ventral fins very small and just in front of the vent; anal corresponding to the dorsal, but not commencing till opposite the root of the pectoral; caudal fin slightly rounded; lateral line arched on the head, and thence running straight to the tail; upper surface brown, and the scales edged with a deep tinge, giving a reticular appearance; under surface white; tip of the upper pectoral fin black. The *Common Sole* is found extending from the Scandinavian and Baltic Seas southward, and along the Spanish and Portuguese coasts into the Mediterranean, and also on the American coast; it is also commonly found on the Scotch, Irish, and English coasts, but those on the southern and western coasts are most esteemed both on account of their size and flavour.

LEPADOGASTER—Sucker. This genus is distinguished by having its pectoral and ventral fins double, and in having the sucker or saucer-like cavity double; from this peculiarity they have been named by the French *Porte Ecuelle*, or Saucer-bearers.

The *Cornish Sucker* (*L. Ocellatus vel Cornubiensis*) is four inches long; body reddish with dusky spots; four cirrhi in front of the eyes; the mark behind them oval, deep purple, surrounded with a palish-brown ring, and having a brilliant, blue, central spot.

ECHENEIS—Sucking Fish. Of the three species included in this genus, the *E. Remora* is alone found in Europe, whilst the others are natives of the Tropical Seas. They are bad swimmers, but this deficiency is supplied by a remarkable organ placed on the top of the head, which enables them to adhere to other large fishes, or to ships' bottoms, so that without exertion they are conveyed to such situations as are most appropriate for finding their food. This organ is of a rounded form, and has a middle crest, which extends from its anterior to its posterior edge; and from each side pass obliquely outwards several pairs of solid bony plates, which are flat and serrated at their edges, and the whole are kept together by a kind of pin.



Disc of Remora. and from each side pass obliquely outwards several pairs of solid bony plates, which are flat and serrated at their edges, and the whole are kept together by a kind of pin.

The *Common Remora* (Plate 8) is about eleven inches long; colour brown; fins bluish; irides brown, surrounded with gold; and the interior of the mouth of a deep carnation; the body, which is long and conical, is covered with a soft viscous skin, on which the scales are not seen without difficulty till after death, and the animal has become dry; the lateral line consists of a row of jutting points.



The Remora.

The *Remora* has been fabulously gifted with the power of arresting the course of ships by its attachment to their bottoms. Hence its Greek name *Echeneis*, given by Aristotle; and its Latin name *Remora*, of similar import. One remarkable circumstance, however, with regard to the *Remora* has been observed, viz., that it always swims on its back. On the western coast of Africa they are known amongst the Dutch by the name of Dung Fish, from their greedily swallowing whatever filth may be thrown from the ship.

Another genus of this family:—*Cyclopterus*.

ORDER IV.—APODO-MALACOPTERYGIA. WITHOUT VENTRAL FINS.

THE Order Apodo-Malacopterygia include those Fishes in which the ventral fins are wanting; they constitute one natural family of several genera.

Family—SNAKE-LIKE FISHES; *Anguilliformes*.

ILLUSTRATIVE EXAMPLES.

PLATE 9.

Genera.	Species.	Common Name.
Anguilla	- - - - Acutirostris	- - - Sharp-nosed Eel.
Conger	- - - - Vulgaris	- - - Conger.
Ophisurus	- - - - Hyala	- - - Glassy Ophisure.
Muræna	- - - - Meleagris.	
Sphagebranchus	- - - - Rostratus.	
Saccopharynx	- - - - Harwoodii.	
Gymnonotus	- - - - Æquilablatus	- - - Banded Gymnote.
Leptocephalus	- - - - Morrisii	- - - Anglesea Morris.
Ophidion	- - - - Imberbis	- - - Beardless Ophidium.
Ammodytes	- - - - Lancea	- - - Sand-lance.

CHARACTERS OF THE GENERA.

1. **ANGUILLA.** Have the dorsal and anal fins elongated beyond the tail, so as to form a pointed caudal fin; and some of them have the dorsal fin commencing far behind the pectorals, with the upper jaw very short.

2. **CONGER.** Dorsal fin arising either close to the pectoral fins or immediately with them, and the upper jaw always the longer.

3. **OPHISURUS.** The dorsal and anal fins do not reach quite to the end of the tail, which remains pointed and finless; in some the pectoral fins are of the ordinary size, and the teeth pointed.

4. **MURÆNA** (Gr. *μύραινα*). Body snake-like, furnished with pectoral fins, underneath which are the narrow lateral branchial apertures.

5. **SPHAGEBRANCHUS** (Gr. *σφαγή*, a throat, and *βράγχεια*, gills). Branchial openings small, close to each other, and beneath the throat; muzzle long and pointed; pectoral fins rudimentary or deficient; vertical fins in some commencing only near the tail; body and tail nearly cylindrical.

6. **SACCOPHARYNX** (Gr. *σάκος*, a pouch, and *φάρυγξ*, a throat). Head small, and flattened anteriorly; the upper rather longer than the lower jaw; gape enormously wide; teeth in the intermaxillary bones very fine, pointed, and inclining backwards, sometimes also, but not always, in the lower jaw; tongue very small; eyes small, and near the tip of the upper jaw; branchial apertures before and below the pectoral fins; body scaleless, compressed, serpentine, and capable of great distension; tail very long, and becoming filamentous at the tip.

7. **GYMNONOTUS** (Gr. *γυμνός*, naked, and *νότος*, the back). Gill opening partly covered by membrane, situated in front of the pectoral fins; anal fin extending from the vent, which is immediately behind the pectorals, to the tail; no dorsal fin.

8. **LEPTOCEPHALUS** (Gr. *λεπτός*, slender, and *κεφαλή*, a head). Body thin, compressed laterally; dorsal and anal fins very small, and running into the tail, no pectorals; head very small, muzzle pointed; teeth small; sides of the body marked with oblique lines running into the lateral line, which is straight.

9. **OPHIDIUM** (Gr. *ὄφιδιον*, the name of a fish, used by Pliny). Head covered with large scales; branchial membrane and opercle very wide; body and tail long, compressed, sword-shaped, and irregularly studded with scales; dorsal, caudal, and anal fins connected; in some species the lower jaw bearded.

10. **AMMODYTES.** Snout sharp; upper jaw extensile, and shorter than the lower; dorsal fin with simple jointed rays; anal fin; forked caudal; fins not united.

ANGUILLIFORMES.—DESCRIPTION OF THE SPECIES.

ANGUILLA—The True Eel. These Eels are recognized as fresh-water fishes; for though they migrate to the sea in the end of the year, where they mature their young in the sludge, yet at the return of the season they ascend the rivers again (according to some), accompanied by the countless brood of the previous year. They are delicate fishes, and very abundant; the best in quality are found in the pure rivers of the chalk districts. There are three species indigenous to the British Islands, viz., the *Sharp-nosed Eel* (*A. Acutirostris*), figured on Plate 9; the *Broad-nosed Eel* (*A. Latirostris*); and the *Glut Eel*, or *Snig* (*A. Medirostris*). The back is dusky green, the belly whitish, inclining to yellowish or brownish, according to the water in which they live; sometimes they are speckled with deep brown. They are found only in fresh water, but indifferently in streams or ponds; and they feed by night upon the spawn of fishes, insects, &c.

CONGER. This Eel occasionally attains the length of eight or nine feet, and the thickness of a man's leg, and weighs a hundred pounds; its back dusky, the belly whitish, the lateral line consisting of numerous white dots; the dorsal and anal fins edged with black. It is found throughout the European seas; its flesh is very coarse, and little esteemed.

OPHISURUS—Snake Eel. This genus is so called from its general resemblance to the snake form; a portion of its tail is destitute of fins, and its extremity has a pouch like a serpent. This Eel is about five or six feet long, and as thick as a man's arm, with a slender, pointed muzzle; brown above, silvery beneath; the lateral line dotted. Found in the Mediterranean. One species, the *Glassy Ophisure* (*O. Hyala*), is figured on Plate 9.

MURÆNA—Eel. These Eels grow to the length of three feet, and

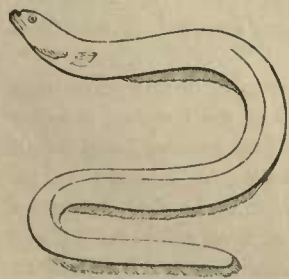
sometimes to a greater length; they are very voracious, and far from being inviting in appearance; their colour is mottled, brown, and yellow. Some of the species have but one row of sharp teeth in each jaw, while others have two rows; some have two rows on the vomer, and a single one on the jaws; and others again have two rows on the jaws, and four, like a pavement, on the vomer. The species *M. Meleagris* (Plate 9), *M. Helena*, and *M. Unicola*, are of this genus.

SPHAGEBRANCHIUS. This genus is distinguished from the *Muraena* by the close approximation of the gill openings, which are placed beneath the throat, and each contain four branchial arches. In some species there are not any pectoral fins, such as *S. Rostratus* (Plate 9), about a foot long; the muzzle is projected into a tube-like form, and the orifice of the mouth beneath the head; each jaw is furnished with seven little teeth; between the eyes are two elevated lines full of pores, and running to the tip of the muzzle, at which there are a pair of barbs; general colour brown. Is found in the rivers of Surinam.

SACCOPHARYNX. The first description of this curious genus was given in 1824 by Dr. Mitchell, and named by him, from "the pouch-like form of the throat," *Saccopharynx*. Subsequently, in 1827, a Paper was read by Dr. Harwood, before the Royal Society, giving an account of "a newly-discovered genus of Serpentine Fishes," to which he assigned the name *Ophionathus*, from the general resemblance of its jaws to those of Serpents.

The species *S. Harwoodi* is four feet and six inches long; colour purplish-black; the air-vessel twenty inches, its parietes extremely delicate, and, when partially distended, it measured nine inches in circumference below its union with the tail; dorsal fin commencing about eighteen inches from the snout, terminating gradually on the slender, tape-like tail, which extends about twenty inches and a half beyond, and about the termination of the dorsal fin a few other minute filaments arise; anal fin, commencing from the vent, terminates at about fourteen inches short of the tip of the tail. Tongue almost entirely deficient; teeth disposed above and below in a single row—above only in the margin of the intermaxillary bones, below along almost the whole length of the maxilla; the jaws, when gently opened, measured two inches and a half across, and three and a half from above to below.

GYMNOTOTUS. These fish in their general form resemble the Eels, but differ from them in the situation of the branchial aperture; they are all natives of South America. The name by which they were first designated was *Gymnotus*, but it has been corrected by Schneider to *Gymnototus*. In this genus is found the remarkable animal known commonly as the *Electric Eel* (*G. Electricus*), but no other species is possessed of its peculiar properties.



The Gymnototus.

The use which the stunning power possessed by these animals serves, is to enable them to procure their prey, and devour it at their leisure; for as their teeth are but small, and their intestinal canal very short, a small portion can only be taken at a time, and without this organ the animal would be incapable of providing itself nourishment, which consists of small fish and worms.

The illustrated species is the *Evenlipped Gymnote* (*G. Aequilabratu*); it is about twenty-eight inches in length, body long, snake-like, compressed; the lips obtuse and of equal length; the back is olive-green and the belly silvery, marked with little reddish spots. It was discovered by Humboldt in the great river of St. Magdalen. Resembles in its manners the *Electric Gymnote*, but has no electric apparatus; its air-bladder is single, and does not extend along the tail.

LEPTOCEPHALUS. The species *L. Morrisii* (Plate 9) measures about four inches, and is of a whitish colour, and almost transparent; head much below the level of the back; eyes large, irides golden; the branchial aperture very wide. Found on the English and French coasts, and first discovered by Pennant.

OPHIDIUM. This genus very much resembles the *Muraena* and *Ammodytes*, but the junction of the dorsal, caudal, and anal fins distinguishes it from the latter, as does the branchial apparatus from the former.

The *Beardless Donzelle*, or *Ophidium* (*O. Imberbis*), is, as its title implies, destitute of beard; its dorsal fin so small as to appear little more than a fold of skin; caudal fin slightly rounded; general colour yellow. Is found in the Mediterranean, on the southern coast of France especially, but also in all the European seas.

AMMODYTES. The individuals of this genus have the body like the former. There are two species; the *Sand Eel* (*A. Tobianus*), and the *Sand-lance* (*A. Lancea*), figured on Plate 9. Both species are found on the sandy shores of Britain; their stomach is fleshy and pointed; they have no cæca nor air-bladder; they burrow in the sand, and are captured by digging for them at low water. It is supposed that they contribute to the support of the Salmon in the estuaries. The *Sand-lance* is thicker in the body than the other species; the intermaxillaries are larger, and the dorsal commencing farther forward.

Other genera of this family:—*Gymnothorax*, *Sternarchus*, *Synbranchus*.

ORDER V.—LOPHOBANCHIATA. HOOP GILLS.

THE Fishes of this Order are distinguished by the tuft-like nature of their gills, disposed along the arches of the jaws in pairs; their body is also covered with small plates, giving it an angular form.

ILLUSTRATIVE EXAMPLES.

PLATE 10.

Genera.	Species.	Common Name.
Syngnathus	- - - Typhlus	- - - Needle-fish.
Pegasus	- - - Draco	- - - Sea Dragon.

CHARACTERS OF THE GENERA.

1. **SYNGNATHUS** (Gr. *σύν* and *γνάθος*, *jaws connected*). Head long, both jaws produced united and tubular; body very long, slender, and covered with indurated plates ranged in parallel lines; no ventral fins; under the tail of the males an elongated pouch closes by two folding membranes in some species.

2. **PEGASUS.** Muzzle much projecting, and of a tubular form, with the mouth opening beneath; body wide, depressed, and covered with scales connected like the plates of a coat of mail; branchial opening single; ventral fins behind the pectoral, which are sometimes very broad; dorsal and anal fins opposite each other.

LOPHOBANCHIATA.—DESCRIPTION OF THE SPECIES.

SYNGNATHUS—Pipe-fish. The individuals composing this genus, move in the water much in the same manner as Eels. They feed on marine animals of very small size, also upon small crustacea and the spawn of fish.

The *Deep-nosed Pipe-fish* (*S. Typhlus*) is thirteen inches in length; jaws compressed and deep, so that their upper and lower edges are nearly on the same plane as the upper and under surfaces of the head; body hexangular, the middle lateral angle on each side becoming the upper angles of the quadrangular tail at the end of the dorsal fin, the middle of which is nearly in the middle of the whole length of the fish; the sculptured plates are eighteen on a side between the shoulder and the vent, behind which they are about thirty-seven; the belly rounded; anal fin very small, caudal pointed, its two central rays the longest, and the others graduated. Its general colour is olive-green, mottled and spotted with yellow, brown, and yellowish-white. It is common along the Dorsetshire coast. Laroche's *S. Rondeletii* and Risso's *S. Viridis* are, according to Yarrell, identical with this species.

PEGASUS—The Sea Dragon (*P. Draco*) is from three to four inches in length; the body of a trigonal form; the large expansion of its pectoral

fins producing some resemblance to the Weevil. Bloch has fancied it forms a connecting link between fishes and insects, as he thinks the Flying Fish connects them with birds. The jaws are beset with small teeth; the eyes prominent, pupil black, surrounded with a yellow ring; the upper part of the body is studded with variously-disposed protuberances, and in the middle of the under part is a prominent, longitudinal ridge, from which the ventral fins arise; these consist each of a long, single ray, and above each pectoral fin is a similar ray, perhaps serving rather the purpose of angling for the fry of other fishes than as organs of swimming, as Bloch observes; the tail is quadrangular; the general colour is bluish, and that of the protuberances brown; the pectoral fins are broad, and thus having a resemblance to wings, whilst the scaly covering of the body resembles the *Sea Horse*, they have been named after Perseus's famous winged horse *Pegasus*.

Other genera of this family:—

HIPPOCAMPUS—*Sea Horse*. These curious animals have derived their title from their filaments resembling the hairs of a caterpillar, and the peculiar curve which the neck and body assume in drying like the head and neck of a horse.

SOLENOTOMUS—*Tubular-mouth*. The large ventral fins uniting with each other and to the body like an apron behind the pectoral fins distinguishes this from the genus *Syngnathus*; this apron serves the same purpose as the pouch of that genus, viz. to support the spawn.

ORDER VI.—PLECTOGNATHI. FIXED JAWS.

Family—GYMNODONTA; *Naked Teeth*.

THE Gymnodonta have, instead of teeth, their jaws covered with a substance like ivory, laminated internally, and resembling the beak of a parrot.

Diodon - - - - Hystrix - - - - Round Diodon.
Orthoriscus - - Oblongus - - - - Oblong Sun-fish.

Family—SCLERODERMATA; *Hard Skins*.

Balistes - - - - Capricus - - - - Mediterranean File-fish.
Ostracion - - - - Triquetrum - - - - Trunk-fish.

CHARACTERS OF THE GENERA.

1. **DIODON** (Gr. δις, *twice*, and ὀδὼν, *a tooth*). Jaws projecting, and together resembling the beak of a Parroquet; the skin covered with large sharp spines, moveable, numerous, and scattered over the whole surface of the body.

2. **ORTHORISCUS** (Gr. ὀρθραγοπτικός, *sucking pig*). Gills furnished with membrane and opercule; jaws undivided, bare, and toothless; body compressed, truncated behind, and not capable of inflation; tail very short and verticle; no ventral fins; dorsal and anal deep pointed and connected with the caudal fin, which is in form of a narrow band.

1. **BALISTES** (Italian *balestra*, a crossbow). Eight teeth in each jaw; body compressed; skin scaly or granular; first dorsal fin spined; second soft and opposite the anal; no true ventral fins, but the pelvis attached to the bones of the shoulder, and sometimes having projecting processes.

2. **OSTRACION** (Gr. ὀστρακον, *a shell*). Body polygonal, and covered along the head with regular bony plates, forming an inflexible coat of mail, so that no part is moveable except the tail, the fins, the mouth, and a kind of lip which is situated about the branchial aperture, all of which pass through holes in this armour; jaws each furnished with ten or twelve conical teeth; to the gills there seems merely a cleft edge with a cuticular lobe, but within there are an opercule and six rays; no ventral fins; dorsal and anal single and very small.

GYMNODONTA, SCLERODERMATA.—DESCRIPTION OF THE SPECIES.

DIODON. These fish, of which Lacepède enumerates five species, are natives of the seas of hot climates, living upon the Crustacea and sea-weed. Like the other fish of the same family, they have the power of inflating the belly, which then gives them the appearance of a chestnut in its bristly shell, hence the French call them *Orbes Epineux*.

One species, the *Round Diodon* (D. Hystrix), is figured on Plate 10.

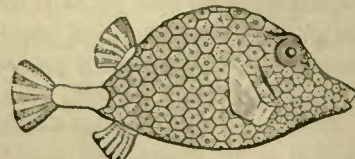
ORTHORISCUS. This genus consists of the species—*Hispid*, *Striped*, *Short*, and *Oblong Sun-fish*; the last of which is represented on Plate 10.

The *Oblong Sun-fish* (O. Oblongus) is about two feet and a half long; body twice as long as its breadth, and marked with small hexagonal figures. Found in the Atlantic.

Other genera of this family:—

TRIODON—*Three-toothed*. It holds an intermediate place between *Diodon* and *Tetraodon*, and by the long pelvic bone which sustains the enormous dewlap, or fan-like disc of skin, it is connected with some of the *Balistes*.

TETRAODON—*Four-toothed* or *Globe-fish*. The fishes of this genus are able to inflate the body like a balloon, by swallowing large quantities of air, which is received into a kind of extensible crop, occupying the whole length of the belly. When thus distended they turn belly upwards, floating upon the surface of the sea, without the power of directing their course; but they are not defenceless, as their inflation erects the spines upon their skin. When caught they make a sort of noise, probably by the escape of the air from their body. Their flesh is considered to be poisonous.



Globe Fish.

BALISTES—the *Mediterranean File-fish* (B. Capricus) is the only one of this genus found in Europe, the others are all natives of the Indian and American seas. The *Balistes* are remarkable for the first dorsal fin, which is composed of two or more spines connected together on a single bone attached to the skull. The generic title is derived from the trivial name of the *B. Capricus*, *Pesce Balestra*, so called by the Italians, from its supposed resemblance to the trigger of a crossbow, for, says Salvian, it has three spines capable of voluntary erection and depression, and although you press the foremost and greatest never so hard, it will not stir, but if you depress the last and least of all never so softly, the other two immediately fall down with it. Artedi applied the name *Balistes* to this genus, from a supposed resemblance of the spine of the *B. Monoceros* to the ancient battering-ram. The English name, *File-fish*, was given to it by Dr. Grew, in his "Museum Regalis Societatis," "from the likeness which the foremost bone upon his back hath to a file." They are remarkable for the brilliancy of their colours; and their flesh, seldom much esteemed, is considered poisonous at particular seasons.

OSTRACION—*Trunk-fish*. The remarkable covering of this genus bears some analogy to the dorsal and ventral shields of the Tortoises, or rather to the bony armour of the Armadillos, their hard covering being indeed bony, and the several portions of which it consists being so well joined together, that the whole seems but a single bone, in shape of an oblong box or coffer. These fish are found only in Tropical Seas, and in the Red and Indian Seas, and in that which bathes the American coast. They feed on *Crustacea* and *Testacea*, the shells of which they easily break down with their teeth.

The species figured on Plate 10 is the *O. Triquetrum*, its body is triangular, and without spines.

SUB-CLASS.—CHONDROPTERYGII. CARTILAGINOUS FISHES.

THE skeleton of the cartilaginous Fishes has no bony fibres, but the calcareous matter is disposed in grains. The sutures of the cranium are indistinct, and the maxillary and intermaxillary bones are reduced to mere rudiments, their place being supplied by the palatine or vomer. Chondropterygii comes from the Greek χόνδρος, a cartilage, and πτερύγιον, a fin.

ORDER.—ELEUTHEROBRANCHIATA VEL BRANCHIS LIBERIS. LOOSE GILLS.

THE gills are free, having a single wide opening and a gill-lid; but without gill-rays.

Family—STURGEONS; *Sturionida*.

ILLUSTRATIVE EXAMPLES.

PLATE 11.

Genera.	Species.	Common Name.
Accipenser	{ Sturio - - - -	Sturgeon.
	{ Ruthenus - - - -	Sterlet.
Polyodon	{ Folium.	
Chimæra	{ Monstrosa - - - -	{ Northern Chimæra, or King of the Herrings.
	{ Callorhyncha - - - -	{ Southern Chimæra, or Elephant Fish.

CHARACTERS OF THE GENERA.

1. ACCIPIENSER. Body long, angular, covered with longitudinal rows of bony plates; snout pointed; mouth, which is under the muzzle, small, tubular, and toothless; palatal bones attached to the maxillaries form the jaws; eyes and nostrils on the side of the head; no external ear.

2. POLYODON. Elongated snout with broad margins; upper jaw armed with two rows of small teeth, and formed by the union of the palatals and maxillaries, with a pedicle of two articulations.

3. SPATULARIA. Throat wide and furnished with small teeth; branchial aperture large, covered with a large gill-flap extending nearly to the middle of the body; skin smooth and scaleless; dorsal fin single, falciform; pectoral small; ventral opposite the origin of the dorsal; anal large; caudal crescentic, its upper lobe longest.

4. CHIMÆRA. Branchiæ opening by a single aperture on either side; the jaws covered with hard undivided plates instead of teeth; muzzle prominent and pierced with pores disposed in regular lines; first dorsal fin above the pectoral, and armed with a strong spine, the second commencing immediately behind the first, and extending to the root of the tail, which is terminated in a thread-like form; the males distinguished by trifid osseous appendages attached to the ventral fins, on the front of the roots of which are two spiny plates, and a small fringed crest on the head.

ELEUTHEROBRANCHIATA.—DESCRIPTION OF THE SPECIES.

ACCIPIENSER—*Sturgeon*. The Sturgeons, both in their external form and general internal organization, strikingly resemble the Shark family.



Sturgeon.

They are of large size, some having been found to measure from six to eight feet in length, and to weigh from two to three hundred pounds.

The *Common Sturgeon* (*A. Sturio*) is about six feet long; its eyes and nostrils are on the side of the head, and barbules issue from the muzzle: there is no external ear, and the air-bladder is large, communicating with the gullet by an extensive opening.

Along the northern coasts of Europe, and in some rivers which they ascend, the *Common Sturgeon* is very abundant, and extensive fisheries are established for its capture. The flesh is generally agreeable, and their eggs and roe are made into caviare, while the finest isinglass is produced from their thick air-bladders.

The *Sterlet* (*A. Ruthenus*) is about two feet long; its flesh is highly esteemed, and the caviare made from it is reserved for the Russian Court.

POLYODON (*SPATULARIA* of Dr. Shaw). The individuals of this genus have a general resemblance to the Sturgeons; but their gill-openings are wider, and the gill-lid extends to half the length of the body; gape much cleft; teeth numerous and small. The spinal cord is like that of the Lamprey, also the spiral valve, which is common to most of the order. They have an air-bladder, but the pancreas is partially divided into cæca.

There is but a single species known—the *P. Folium* (Plate 11); it is found in the Mississippi, and of its habits little is known. The spatula-like muzzle is about four or five times as long as its breadth, and upon its upper surface has a middle keel-shaped ridge, which is gradually lost about two-thirds from its base, resembling the midrib of a leaf, and the resemblance

is rendered more close by the reticular ridges observed on each side, and hence Lacepède has given the specific name *feuille*, leaf; on its under surface the membrane covering it forms a hollow in which the lower jaw is received.

CHIMÆRA. Of this genus, which gets its name from its uncouth form, there are but two species:—

The *Northern Chimæra* (*C. Monstrosa*), called by the Norwegians “King of the Herrings;” measures about three feet long; is of a silvery colour spotted with brown; at night its eyes are brilliant like those of the Cat, whence in the Mediterranean it is called the Sea Cat. It is often seen lurking among the shoals of Herrings. The Norwegians salt its roe, and express an oil from the liver, which they employ for certain diseases of the eye; of the tail they make pipe-pickers; the flesh is not eatable.

The *Southern Chimæra* (*C. Callorhyncha*), named by Cook the Elephant Fish, is distinguished from the preceding species by a fleshy projection on the muzzle in the form of a hoe, from which it has acquired the name given by Cook. Its general colour is silvery; brownish on the upper parts. Native of the Southern Seas. (Plate 11.)

ORDER.—PYCNOBRANCHIATA, VEL BRANCHIS FIXIS.

CLOSE GILLS.

THE gills of this Order are attached to the outer edge, having a separate opening, through which the water from each gill escapes. They form two families.

Family—TRANSVERSE MOUTHS; *Plagiostomata*.

ILLUSTRATIVE EXAMPLES.

PLATE 12.

Genera.	Species.	Common Name.
Squalus	- - - - Carcharius	- - - - White Shark.
Squatina	- - - - Angelus	- - - - Angel-fish.
Torpedo	- - - - Narke	- - - - Spotted Torpedo.
Raja	- - - - Clavata	- - - - Rough Ray.

Family—LAMPREYS, OR ROUND MOUTHS; *Cyclostomata*.

Petromyzon	- - - - Marinus	- - - - Sea Lamprey.
Gastrobranchus	- - - - Cæcus	- - - - Myxine or Hog.

CHARACTERS OF THE GENERA.

1. SQUALUS. Muzzle prominent; beneath it in front the nostrils, not elongated nor with lobes; teeth cutting, pointed, and often serrated on their edges; inspiracles sometimes extremely small; branchial apertures either partially above the pectoral fins or entirely before them; first dorsal fin much in front of the pectorals, second opposite the anal; caudal fin with a second lobe beneath, giving it a more or less forked form.

2. SQUATINA. Mouth at the extremity of the muzzle; head flat and rounded in front; eyes on the dorsal surface; inspiracles; body broad and flattened horizontally; pectoral fins large, extending forwards, but separated from the back by a deep cleft, in which are the openings of the gills; dorsal fins behind the ventral; no anal fin; caudal fin having one lobe above and the other below the extremity of the tail.

3. TORPEDO (Lat. *torpeo*, I numb). Teeth small and sharp; body flattened, oval, and slightly notched in front; skin smooth and bare; tail short, thick, fleshy, and surrounded at its tip with an oblique terminal fin; dorsal fins two, small, and upon the root of the tail; pectorals large; space between the head, gills, and pectoral fins filled on each side with an electric organ, consisting of polygonal columns.

4. RAJA (Celt. *ras*). Body of a roundish form, flattened and very wide from the junction of the pectoral fins with the muzzle; ears and eyes on the upper, and the mouth, nostrils, and gill apertures on the under surface; teeth small and close set in a tessellated form; tail slender, furnished with two small dorsal fins, and sometimes with an imperfect caudal fin.

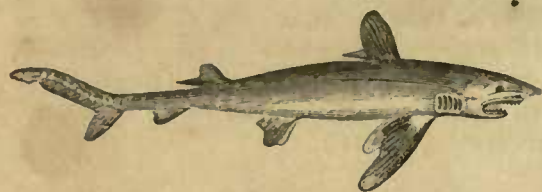
1. PETROMYZON (Gr. *πέτρος*, a rock, and *μύσσω*, I suck). Head thinner than the body; mouth beneath hollowed like a cup, its edge surrounded by a fleshy lip, and its cavity beset with fleshy tubercles covered with very

tough horn, and answering to teeth; tongue beset with two rows of very small teeth, and extensile; on each side of the head seven branchial apertures, with a peculiar canal commencing immediately below the gullet connected with them; two dorsal fins distinct; no anal fin; tail fin consisting of a longitudinal fold of skin above and below supported on very delicate, indistinct rays.

2. GASTROBRANCHUS (Gr. γαστήρ, a belly, and βράγχια, a gill). Openings of the gills under the belly; no fins except the caudal.

PLAGIOSTOMATA, CYCLOSTOMATA.—DESCRIPTION OF THE SPECIES.

SQUALUS—*Shark*. The Sharks are extremely ferocious, and of proverbially gluttonous habits. They do not swim with great speed, their progress being retarded in some degree by the position of their mouth requiring



Shark.

them to turn on one side when about to seize their prey. They were formerly said to be possessed of a fine scent, but Quoy and Gaimard have proved that this is not the case, and that rather their vision is acute. They appear to be found in all seas, mostly upon the coast, but between the tropics are often met with on the high sea. Their habits are generally solitary, except when hunger draws them into bays or other inlets, when they are seen in swarms. Their flesh is coarse and tasteless, but rarely eaten except from the tail. The liver is very greasy, and large quantities of oil are obtained from it. The skin rough, and from some species it is used in the manufacture of a sort of shagreen.

The *White Shark* (S. Carcharias) measures from twenty-five to thirty feet in length; the body spindle-shaped, and covered with hard granular skin; head large, muzzle largely furnished with pores which exude a glairy secretion; mouth large, wide, and semicircular; upper jaw armed with six, and the lower with four rows of teeth, amounting to four or six hundred; tongue short,



Head of Shark.

thick, and rough, as is also the palate; eyes round, the irides pearly-white, and the pupils blackish; upper parts of the body brown, under parts white, and two rows of black pores upon the sides.

SQUATINA—*Angel-fish*. The *Angel-fish* (S. Angelus) is from five to seven or eight feet long, and up to one hundred pounds in weight; upper surface dark mottled-chocolate, under parts dirty white. From the supposed resemblance of the pectoral fins to wings, the animal has acquired its name of *Angel-fish*. It is not uncommon upon the British coast, where it is known as the *Angel*, *Monk*, or *Fiddle fish*, from the size of its pectoral fins, from the head being sunk within the pectoral as within a cowl, or its shape resembling a fiddle. It produces in the spring and autumn seven or eight young ones. It is a very fierce and voracious animal.



Torpedo.

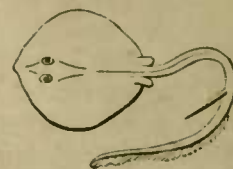
TORPEDO—*Cramp-fish*. The space between the pectorals and the head is filled by an electric apparatus, amply supplied with nerves, and consisting of numerous cells like honeycombs, in the intervals of which a mucous fluid is contained. The shocks are not so benumbing as those by the *Gymnotus*. This remarkable numbing property was known to the ancients.

The *Torpedos* are predaceous and live on sandy places, where they bury themselves at a slight distance below the surface by a quick flapping of their fins, which throws the sand over them. They will live for twenty-four hours out of water, but not longer.

The *Spotted* or *Eyed Cramp-fish* (T. Narke) occasionally measures about twenty inches in length; eyes black; upper surface reddish-yellow, marked with five large roundish spots azure blue changing to grey, each surrounded with a broad brown circle, and arranged in a pentagonal form, accompanied with numerous whitish spots; under surface whitish; spiracles dentated.

RAJA. The upper surface of the body, in all the individuals of this genus, is more or less armed with spines, and in some species a distinct row passes along the ridge of the back to the tip of the tail.

The *Rough* or *Thornback Ray* (R. Clavata) is more than two feet in length; muzzle pointed; skin shagreened; upper parts brown sprinkled with whitish spots, but sometimes white with black spots. They are common on the British sands, feed on flat-fish, are very fond of Herrings and Sand-eels, and sometimes eat crustaceous animals. They bring forth their young in July and August, and before these are old enough to breed they are commonly called *Maids*.



Raja.

Other genera of this family:—Rhina, *Round-muzzle*; Rhinobatus, *Sharp-snout*; Selache, *Basking-Shark*; Scyllion, *Dog-fish*; Scymnus, a kind of *Shark*; Spinox, *Prickly-Shark*; Trygon, *Sting-ray*; Zygæna, *Hammer-head*.

PETROMYZON—*Lamprey*. The Lampreys are remarkably characterised by the canal which leads from the cavity of the mouth beneath the gullet to their bag-like gills, and which corresponds to the windpipe of *Mammalia*. The mouth itself has much resemblance to a shallow cup, which the animal is capable of exhausting so as to attach itself firmly to any substance, whilst the horny teeth contained in its surface either hold it more tightly, or, if soft, break it into small pieces so that it may more readily pass the narrow aperture of the gullet; by this powerful organ they attach themselves to large fish, penetrate their skin, and devour them. They are found in most of the European rivers.



Mouth of Lamprey.

The *Sea Lamprey* (P. Maximus) is about two or three feet in length; the head is of a greenish-brown colour; the eyes round with a black pupil and golden iris; the back and sides are marbled with green and blue, and the belly white; the dorsal fins are orange marbled with brown, and the caudal bluish.



Lamprey.

This is a sea-fish, but, like the *Salmon*, it leaves the salt water early in the spring, and enters the mouths of rivers, probably for the purpose of spawning. On its first arrival, and during March, April, and May, its flesh is firm and highly flavoured, but after that time becomes flabby and unsavoury. It sometimes weighs as much as three pounds, and occasionally four or six.

GASTROBRANCHUS. In this genus the spaces between the branchial arches open on each side into a single canal, which terminates beneath the heart; mouth circular, surrounded with eight little beards, and having a hole pierced through its upper edge; a single tooth is found on the top of the maxillary ray, but those of the tongue are strong, and disposed in two lateral rows; body cylindrical. Two species; one found in the North Sea—the *Myxine* (G. Cæcus), which often annoys the *Turbot* fisheries, by attacking the fish that are hooked, and leaving nothing but the skin and bones. The other—*G. Dombey*, on the *Guinea* coast, and considered by *Schneider* as merely a variety of the former.

PRISTIS—*Saw-fish*. This genus is of the family *Selacia*, and was formerly included in the genus *Squali*, till *Linnaeus* removed it in the year 1794, and placed it as it now stands. There are six or more species.

Order. Quadrumana.

MAMMALIA.

Family. Simiidae.

Plate I.

Genera—*Simia*—*Semnopithecus*—*Cercopithecus*—*Cynocephalus*



Simia Satyrus. Ourang Outang.



Semnopithecus Maurus

Lotong



Semnopithecus Nasicus. Proboscis Monkey.



Cynocephalus Mormon. Great Baboon.

Order. Quadrumana.

MAMMALIA.

Family. Simiidae.

Plate 2.

Genera. Cebus and Hapale.

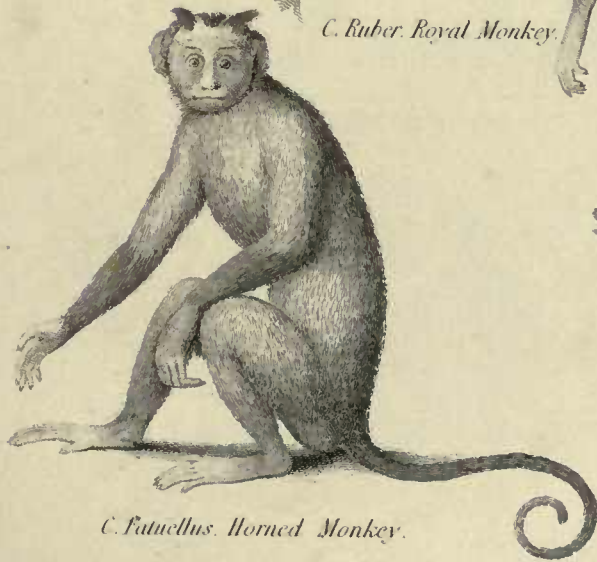


C. Ruber. Royal Monkey.



C. Coëta. Four

fingered Monkey.



C. Patuellus. Horned Monkey.



C. Scurens. Squirrel Monkey.



H. Communis. Striated Monkey



H. Rosalia. Silky Monkey.

MAMMALIA.

Plate 3

Order, Quadrumana.

Genera, Lemur, Lichanotus, Stenops, Otolicnus, Tarsius.

Family, Lemuridæ.



L. Catta. Ring tailed Macauco.



L. Madagascariensis Indri.



S. Tardigradus. Bengal Lori.



O. Senegalensis. Senegal Galago.



T. Daubentonii. Daubenton's Tarsier.



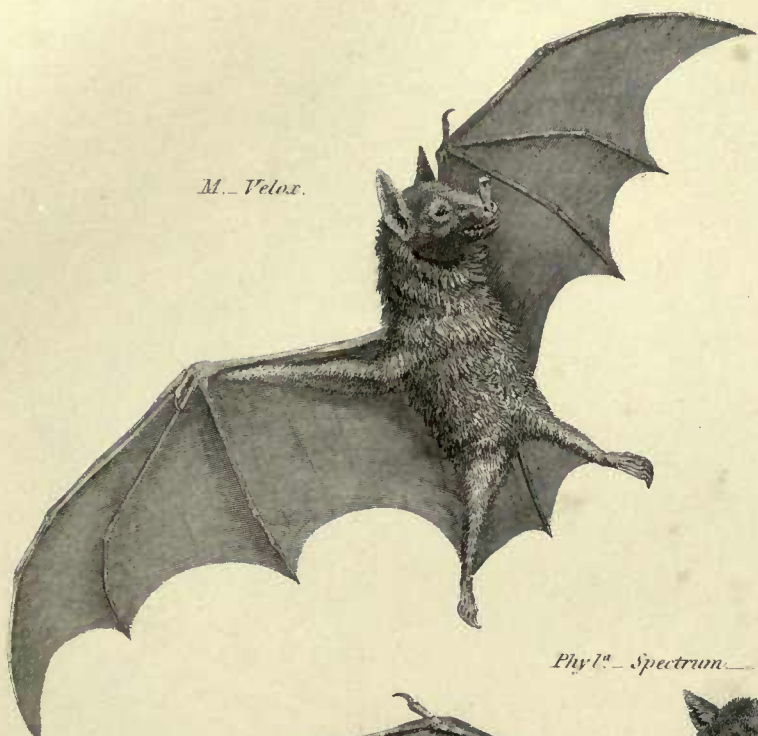
T. Bancanus. Banca Tarsier.

Order. Cheiroptera.

MAMMALIA.

Genera. Pteropus, Molossus, Phyllostoma, Erinaceus, Sorex, Talpa.

Family. Fructivora.



M. Velox.



Pter. Javanicus.



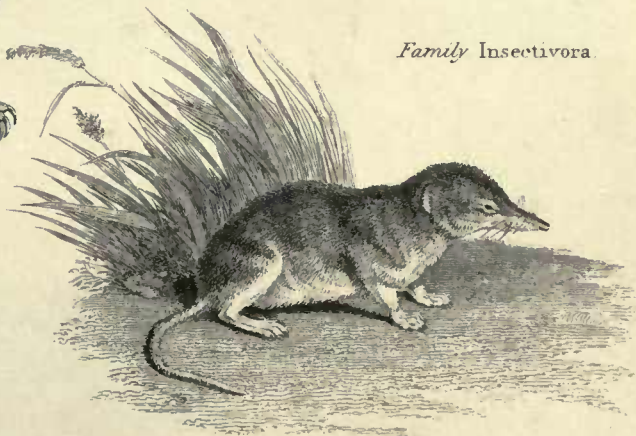
Phyl. Spectrum—Spectre Bat.

Order. Sarcophaga.

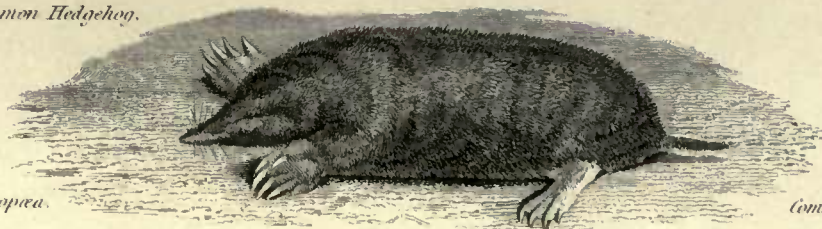
Family Insectivora.



E. Europæa. Common Hedgehog.



S. Araneus. Common shrew.



T. Europæa.

Common Mole.

Chas. J. and Geor. Delin.

J. W. Lowry. Sculp.

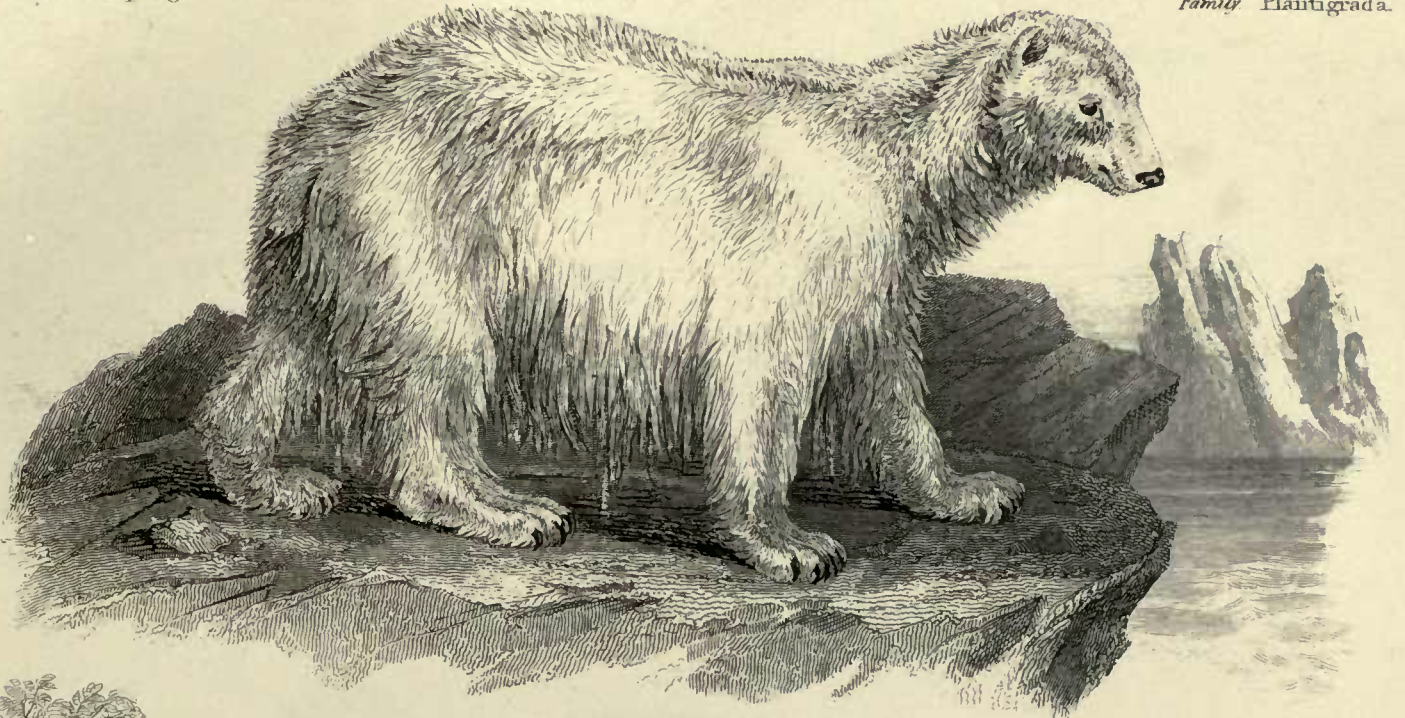
MAMMALIA.

PLATE 5

Order: Sarcophaga.

Genera: Ursus, Nasua, Procyon, Gulo.

Family: Plantigrada.



U. Maritimus. Polar Bear.



P. Lotor. Raccoon.

N. Fusca Brown Coati Mundi.



G. Americanus. Wolverine.

Thos. Lumsden delin.

J. W. Lowry sculp.

Order: Sarcophaga.

MAMMALIA.

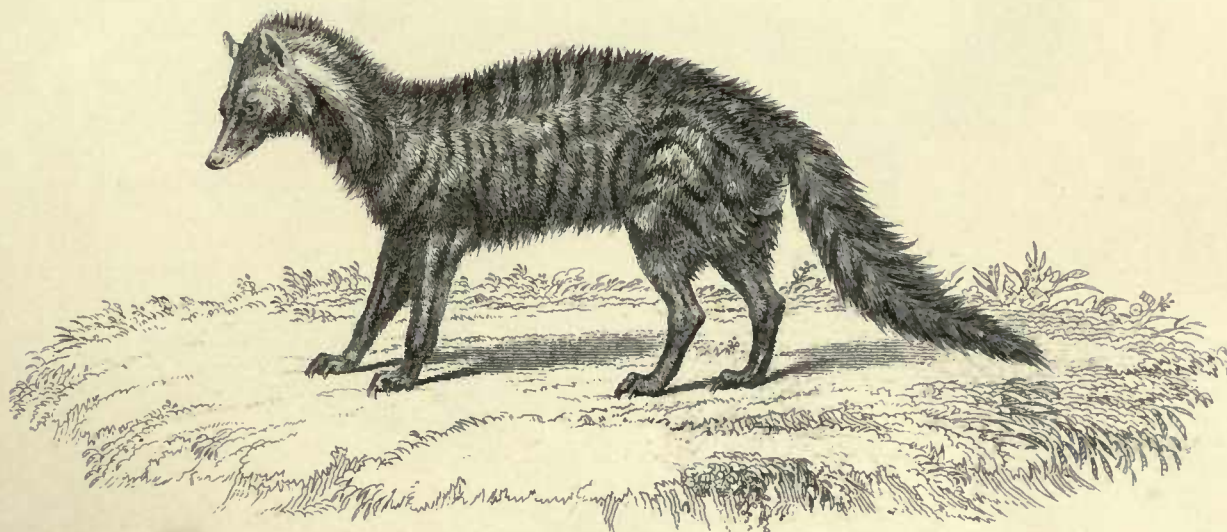
Family Digitigrada.

Genera: Mephitis. Mustela. Viverra. Lutra. Herpestes.



Meph^s. Americana. American Mephitis. (Skunk)

Must^a. Foina. Pine Martin.



C. Civetta. Civet.



L. Vulgaris. Common Otter.

H. Ichneumon. Egyptian. Ichneumon.

MAMMALIA.

Plate . 7

Order Sarcophaga.

Genus. Canis.

Family Digiugrada.



C. Lupus. Wolf

C. Fennecus Fennec.



C. Familiaris. (Var Thibet) Thibet Dog



C. Vulpes. Fox.

C. Aureus Jackal.

Order. Sarcophaga.

MAMMALIA.

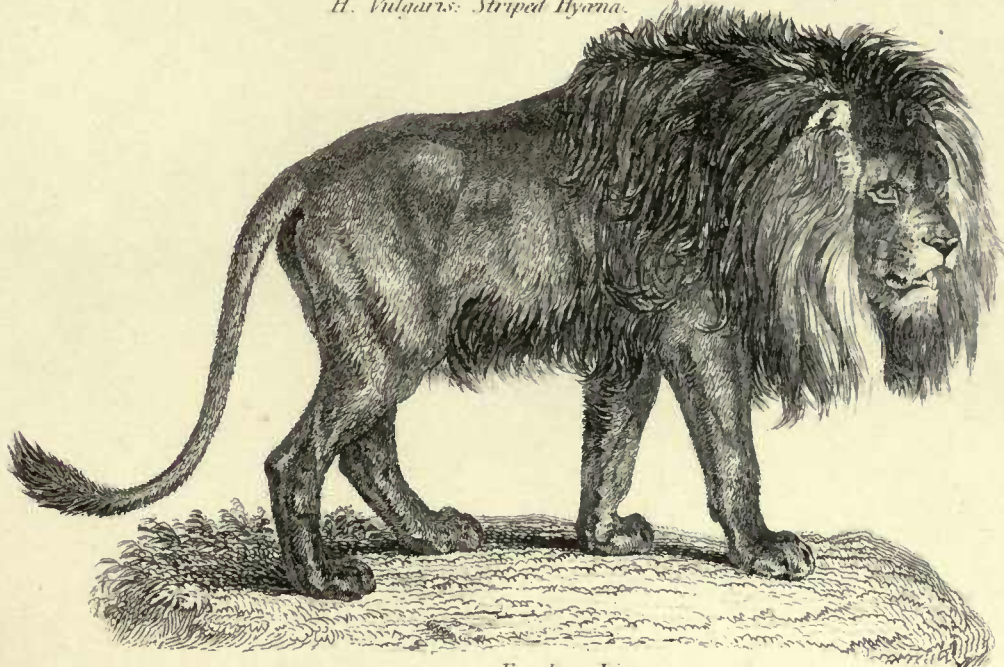
Plate 8

Genera. Hyæna. Felis.

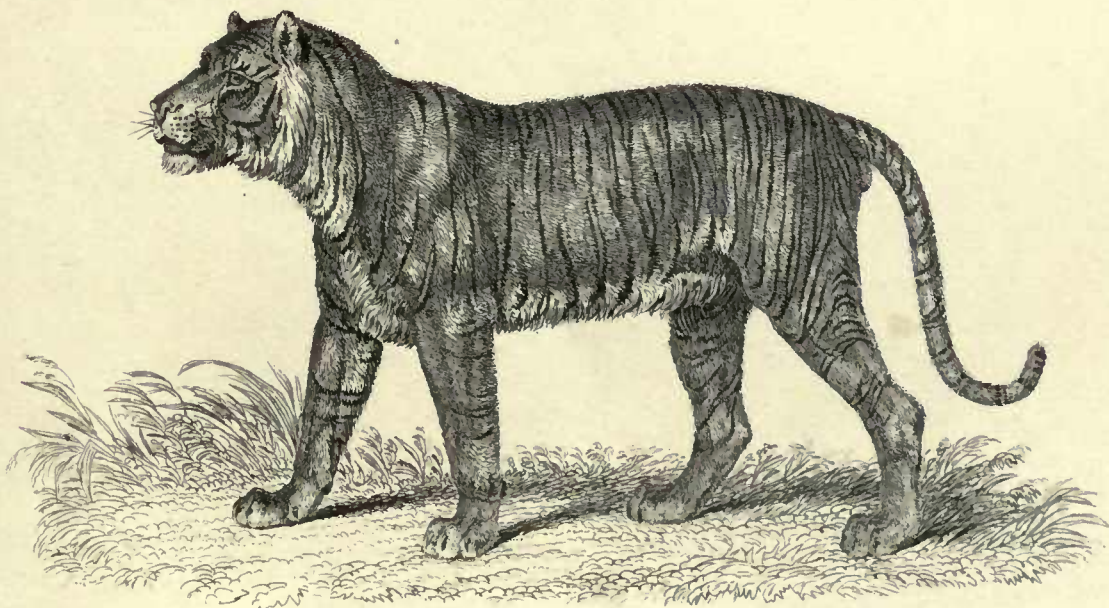
Family. Digitigrada.



H. Vulgaris. Striped Hyæna.



F. Leo. Lion.



F. Tigris. Tiger.

MAMMALIA.

Order: Sarcophaga

Genera. Phoca. Otaria. Trichechus.

Family. Pinnata.



P. Vitulina. — Common Seal.



O. Nigra. — Black Otary.



T. Rosmarus. — Arctic Walrus.

Cha. Landseer delin.

J.W. Leary fecit.

MAMMALIA.

PLATE 10.

Order Marsupialia.

Genera. Didelphis. Dasyurus. Perameles. Phalangista.

Families { Carnivora
Insectivora
Frugivora.



Did. Virginiana. Virginian Opossum.

Dasy. Maudslayi. Maudslayi's Dasyurus.

*Per. Obesula.
Poreuline Peramele*

Phal. Gliriformis. Mouse like Phalangista.

Cha. Landwehr delin.

J.W. Lowry sculp.

MAMMALIA.

PLATE II.

Genera. Hypsiprymnus, Halmaturus, & Phascogonys.

Order. Marsupialia

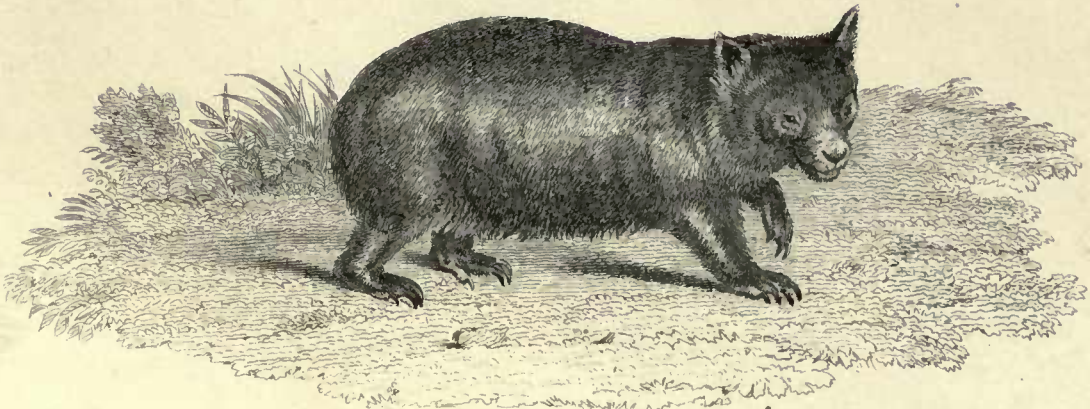
Fam. Salientia & Fodientia



Hyp. murinus. Potoroo.



Halm. giganteus. Great Kangaroo.



P. fuscus. Wombat.

Int. Australia. d'Ent.

J. W. Lowry sculp.

MAMMALIA

PLATE 12.

Order. Rodentia.

Genera. Castor, Hypudaeus, Myoxus, Hydromys, Mus, Dipus

Family. Claviculata



Hyp. Lemmus. — Lemming



My. Avellanarius. — Dormouse.



C. Fiber. — Common Beaver.



Hyd. Coypu. — Molina's Coypu.



D. Jaculus. — Egyptian Jerboa.



Mus. Rattus. — Black Rat.

Cha. Landseer, delin.

J.W. Lowry, Sculp.

MAMMALIA

PLATE 13.

Order . Rodentia .

Genera . Pedetes . Arctomys . Pteromys . Lepus . Hystrix .

Family . Claviculata .

—— Hemiclaviculata



A. Alpinus . — Alpine Marmot



Ped. Capensis . — Cape Jerboa .



Pter. Sabrinus . — Greater Flying Squirrel .



L. Timidus . — Common Hare .



L. Pusillus . — Calling Hare .



H. Cristata . — Common Porcupine .

Order. Edentata.

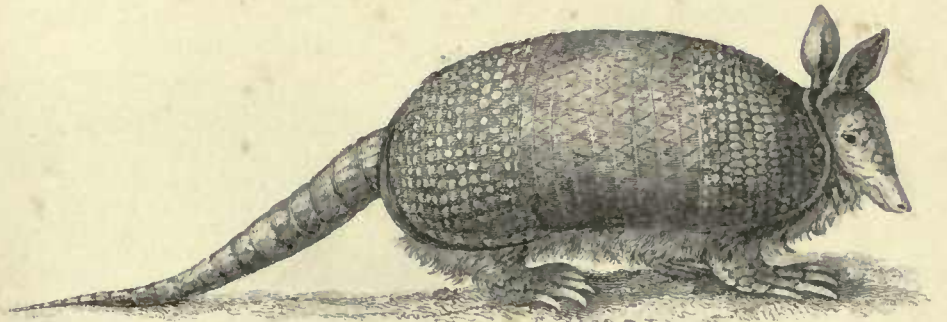
MAMMALIA.

Plate 14

Genera. Bradypus. Dasypus. Myrmecophaga. Manis. Echidna. Ornithorhynchus.



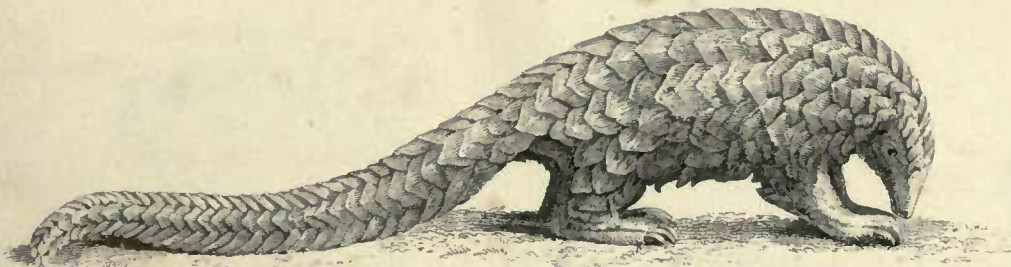
B. Tridactylus. Three toed Sloth.



D. Novemcinctus. Nine banded Armadillo.



M. Jubata. Great Ant-eater.



M. Macroura. Long tailed Manis.



E. Histrix. Spiny Echidna.



O. Paradoxus Rufus Ornithorhynque.

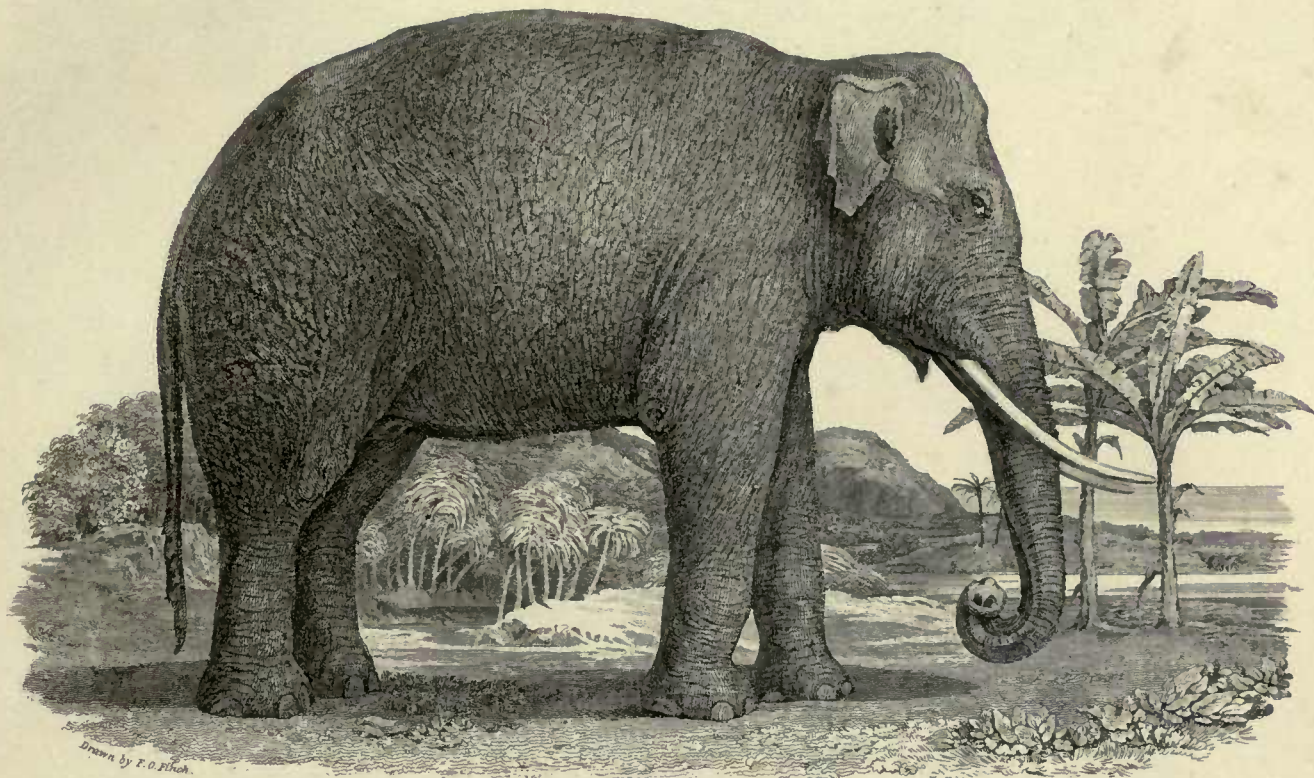
MAMMALIA.

Plate 15

Order. Pachydermata.

Family. Proboscifera

Genus. Elephas.



E. Indicus. Indian Elephant.

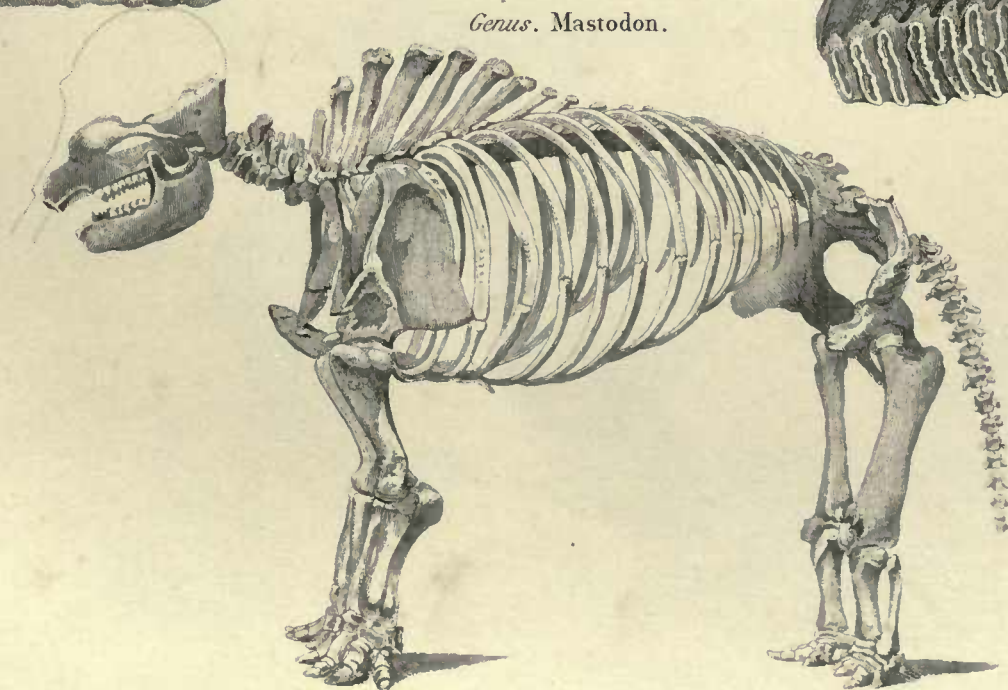
Tooth of African Elephant.



Tooth of Indian Elephant.



Genus. Mastodon.



M. Giganteum. Gigantic Mastodon.

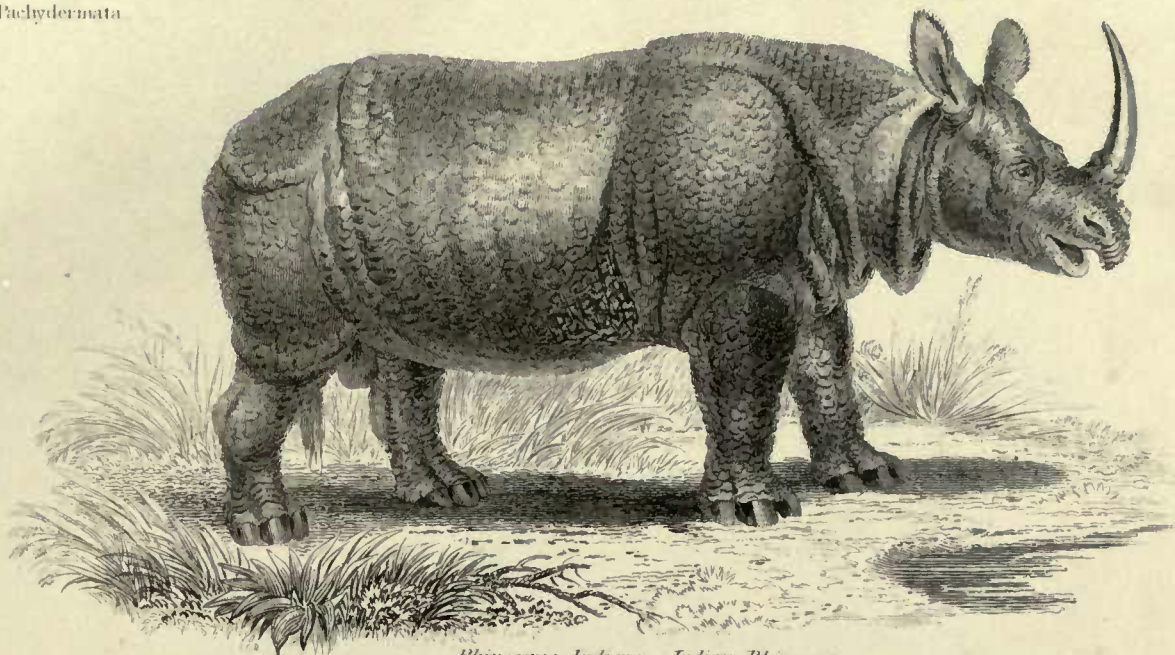
MAMMALIA.

PLATE 16

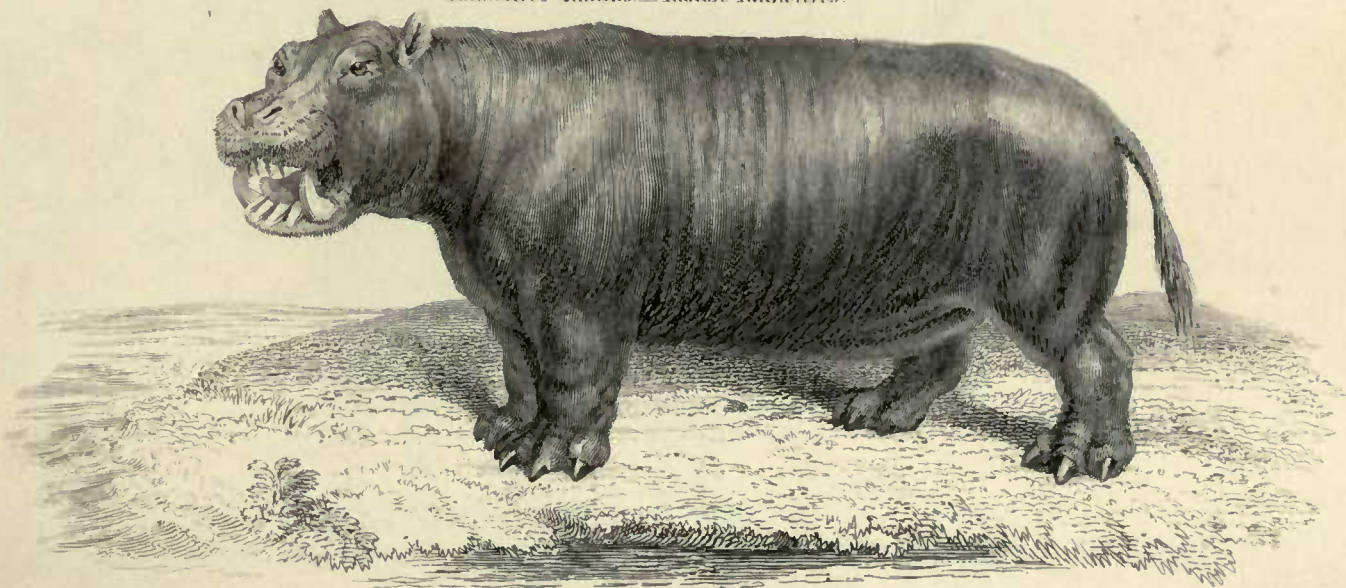
Genera Rhinoceros, Hippopotamus, Tapirus.

Order Pachydermata

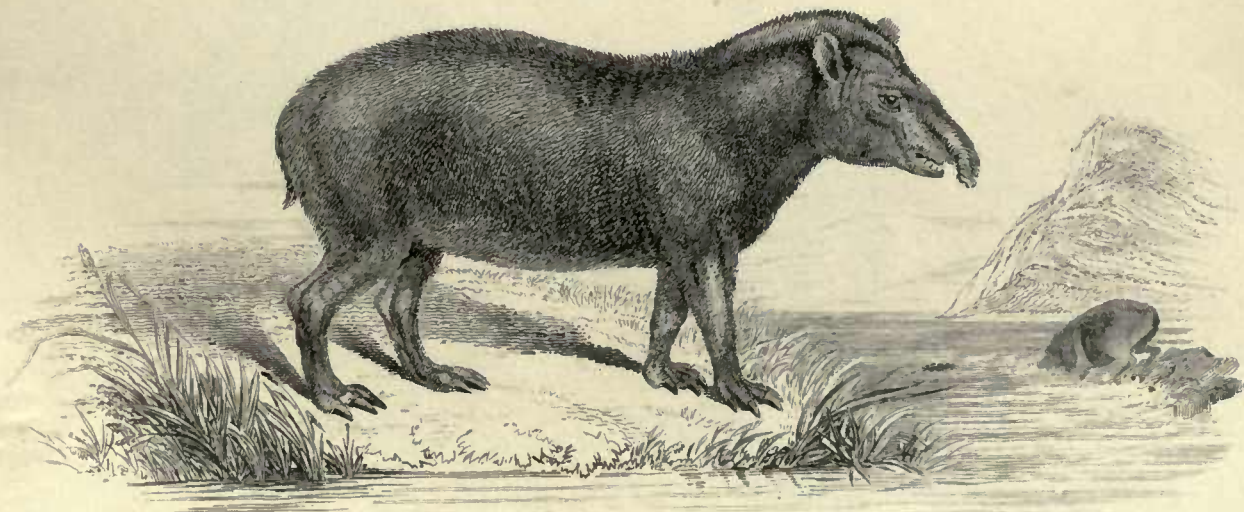
Family Proboscifera



Rhinoceros Indicus. — Indian Rhinoceros.



Hippopotamus Amphibius. — Hippopotamus.



Tapirus Americanus. — American Tapir.

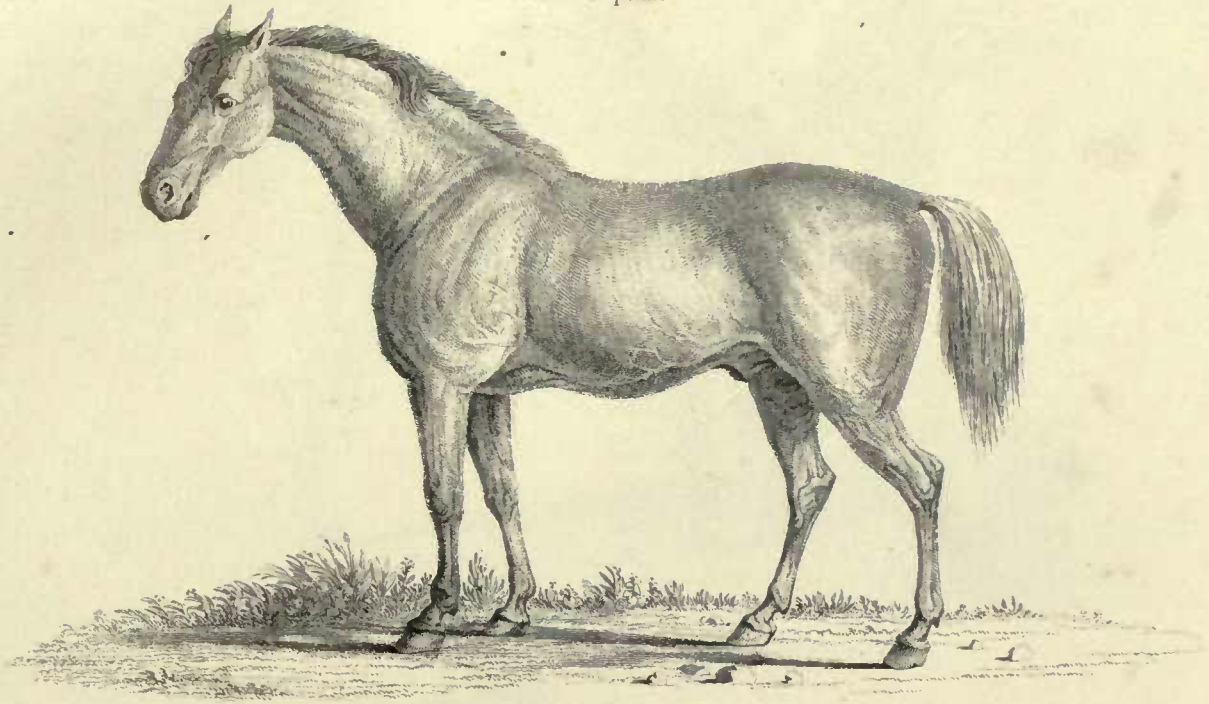
Chas' Landseer delin.

J. H. Leary sculp.

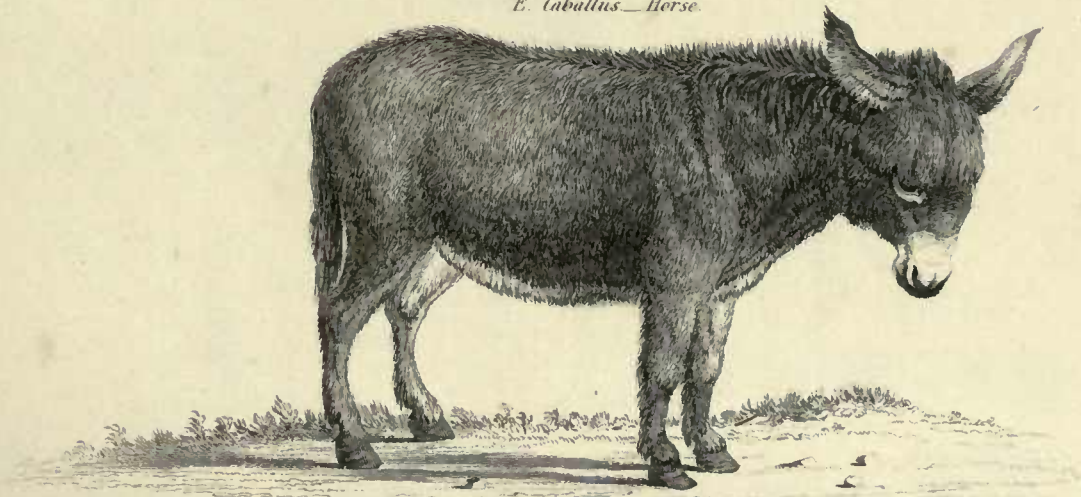
MAMMALIA.

Genus. Equus.

Solipeda



E. caballus.—Horse.



E. asinus.—Ass.



E. zebra.—Zebra.

MAMMALIA.

PLATE 18

Genera. Camelus, Auchenia, Moschus.

Order Ruminantia.

Family Acornia.



C. Dromedarius.—Dromedary.



A. Lama.—Llama.



M. Javanica.—Java Musk.

J. W. Lowry, Sculp.

MAMMALIA

PLATE 19

Order. Ruminantia .

Genera. Cervus, Camelopardalis .

Family. Solidicornia .



Cer. Alces .— Elk or Moose Deer .



Cer. Capreolus .— Roebuck .



Cer. Tarandus .— Reindeer .



Cam. Giraffa .— Camelopard .

Chas. Landseer delin.

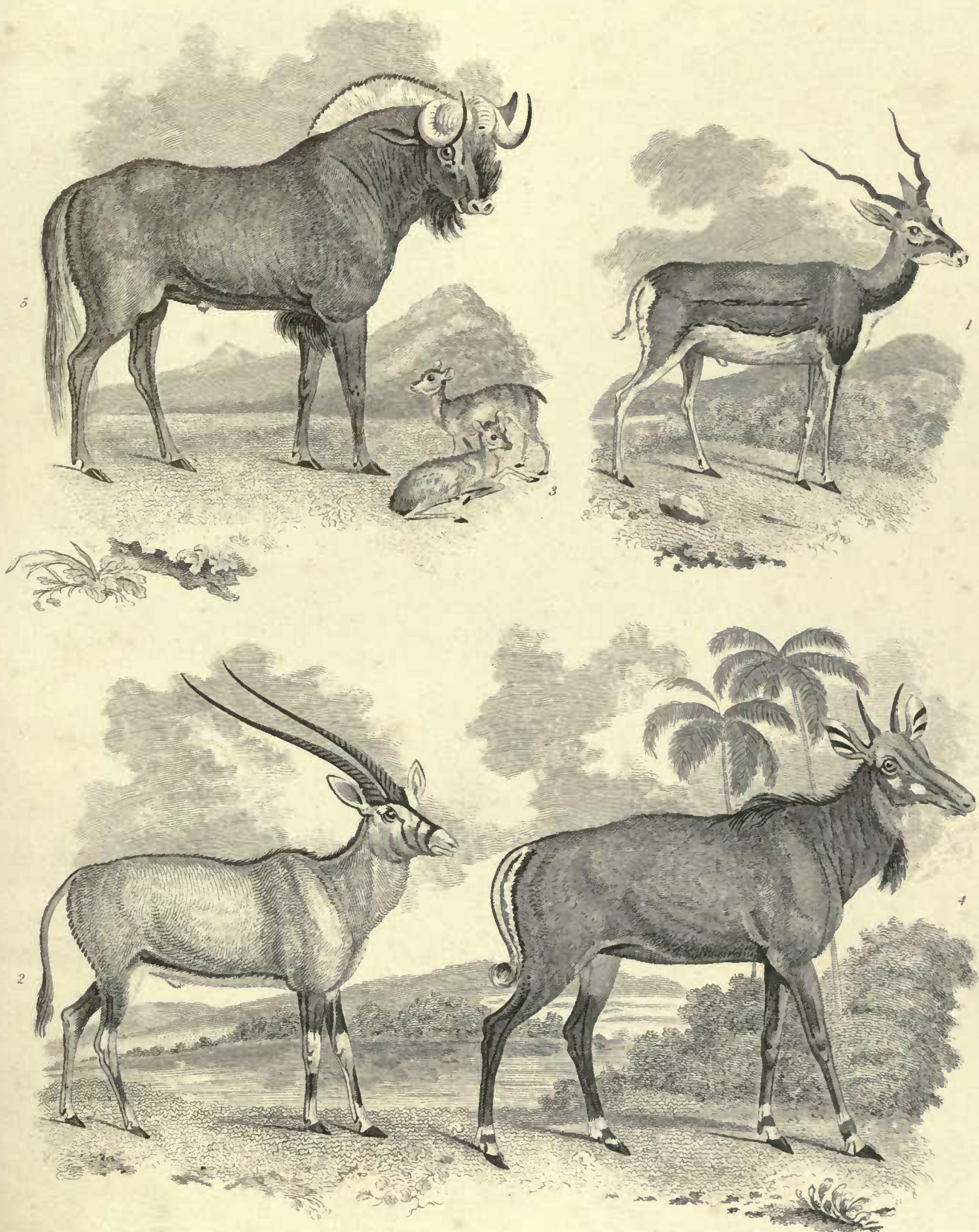
J.W. Lowry. Sculp.

MAMMALIA.

Order Ruminantia

Genera. Antelope

Family Cavicornia



1 *A Cervicapra* Common Antelope. 2 *A Oryx* Egyptian Antelope. 3 *A Nygmia* Royal Antelope.
4 *A Picta* Whitefooted Antelope. 5 *A Gnu* Gnu Antelope.

Griffith sc.

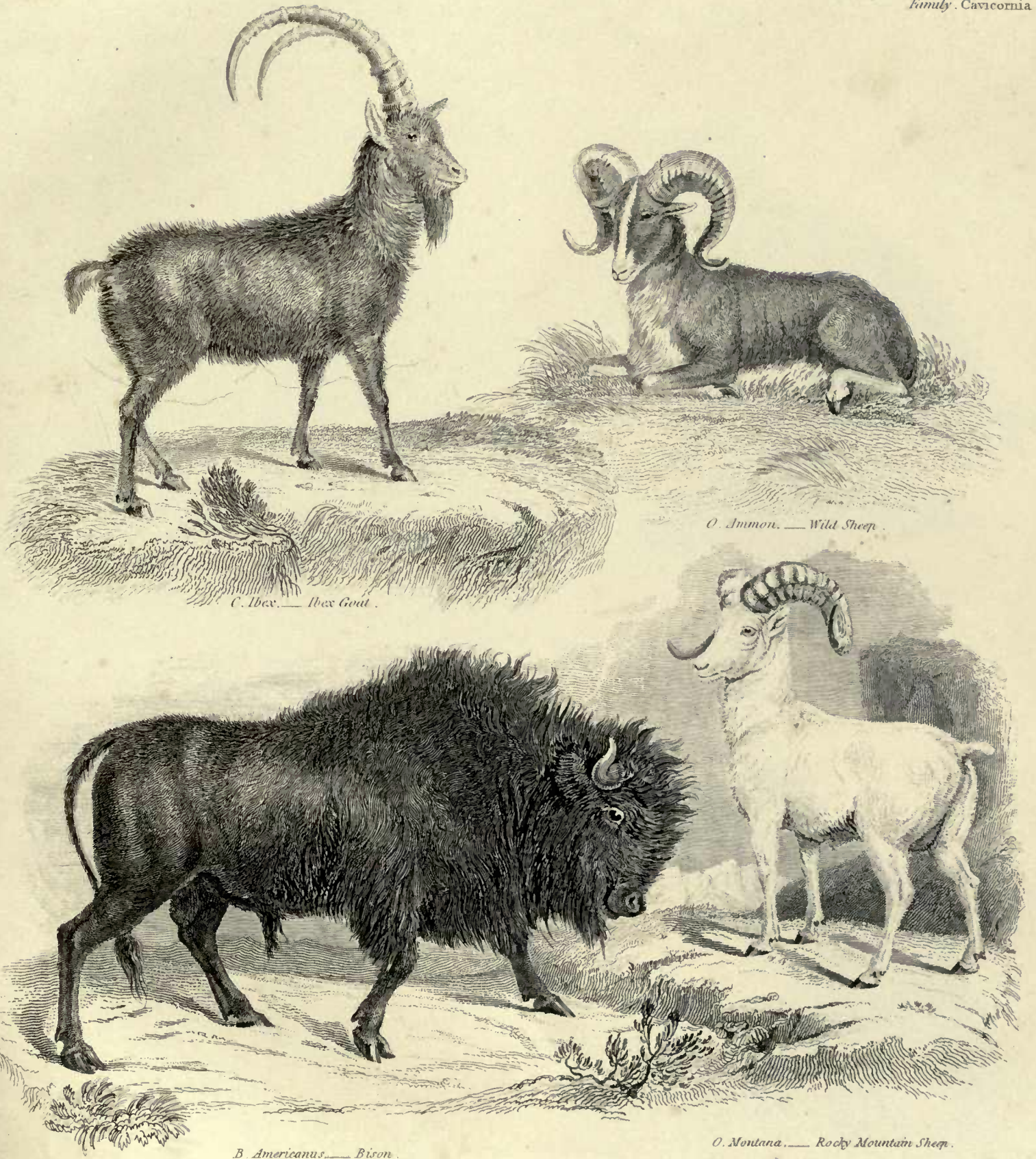
MAMMALIA

PLATE 21

Genera . Capra , Ovis , Bos .

Order . Ruminantia .

Family . Cavicornia



C. Ibex. — Ibex Goat .

O. Ammon. — Wild Sheep .

B. Americanus. — Bison .

O. Montana. — Rocky Mountain Sheep .

AVES.

Plate 1.

Order. Accipitres.

Family. Diuturnæ

Genera. Vultur. Sarcoramphus. Percnopterus & Gypætos.



Vultur Monachus. Monk Vulture.



Sarcoramphus Papa. King Vulture.



Percnopterus Egyptianus. Egyptian Vulture.



Gypætos Barbatus. Alpine Gypæte.

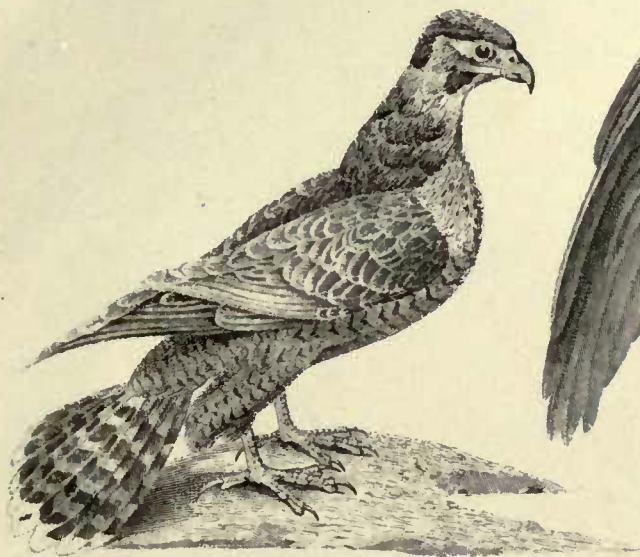
AVES.

Plate 2

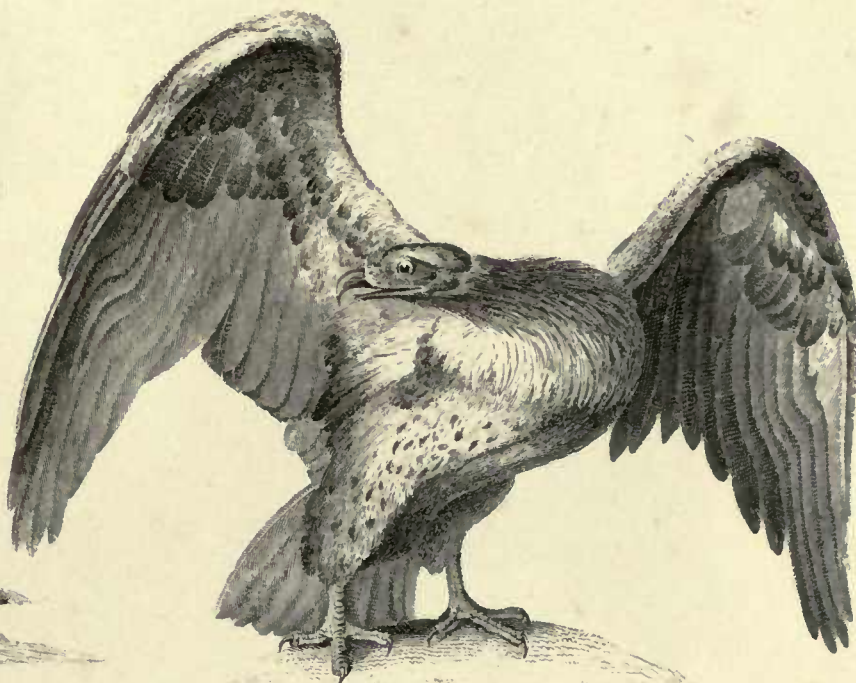
Order Accipitres

Family Diurnæ

Genera Falco & Gypogéranus



F. Communis. Common Falcon



F. Ossifragus. Sea Eagle



F. Pennatus. Booted Buzzard



G. Capensis. Snake Eater

AVES.

Plate 3

Order, Accipitres.

Genus, Strix.

Family, Nocturnæ.



Str. Aluco. Brown Owl.



Str. Otus. Long Eared Owl



Str. Flammœa. White Owl.



Str. Nyctea. Snowy Owl.

Drawn by P. O. Finch

Engraved by J. W. Lowry.

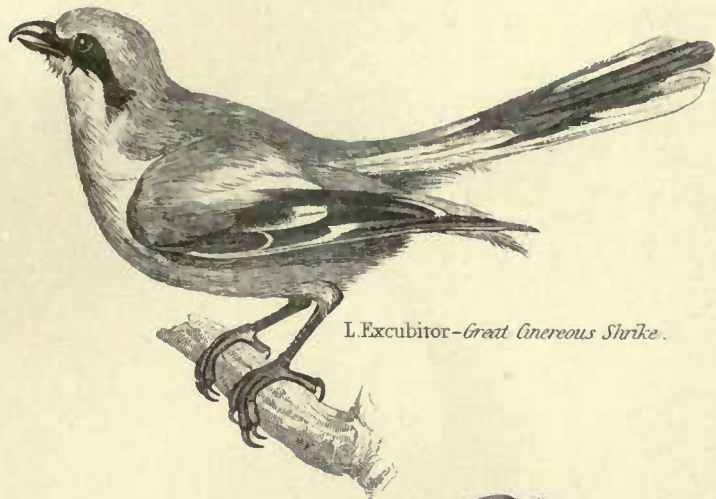
AVES.

PLATE 4.

Order. Passeres.

Family. Dendrocygnae.

Genera. Lanius. Muscivora. Tanagra. Turdus. Rupicola. Eurylaimus.



L. Excubitor - Great Anereous Shrike.



M. Grisola - Spotted Flycatcher.



Tan. Vittata - Banded Tanager.



Tur. Polyglottus - Mocking-bird.



R. Aurantia - Orange Rock Cock.



E. Javanicus.

A V E S .

Order. Passeres

Genera Hirundo Caprimulgus.
Cypselus.

Family. Fissirostres

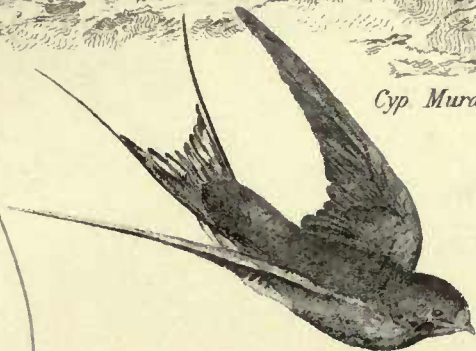
Plate 5



Cyp Murarius. Black Swift.



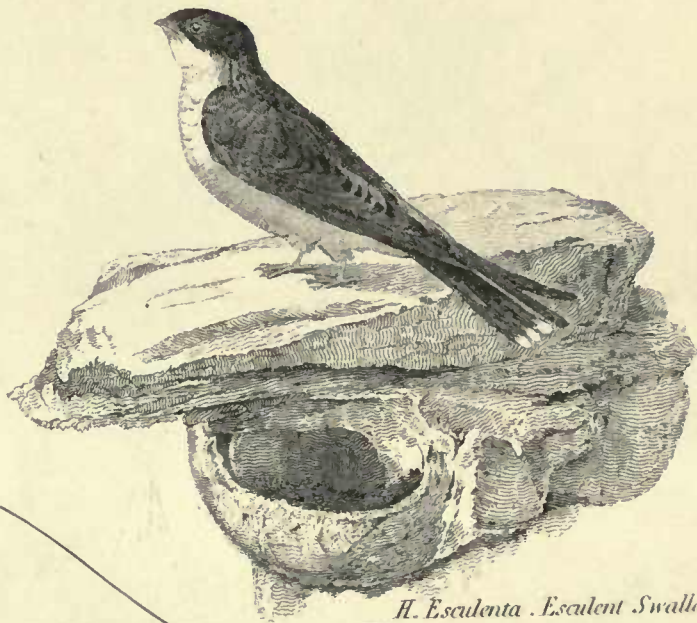
H. Urbica. House Martin.



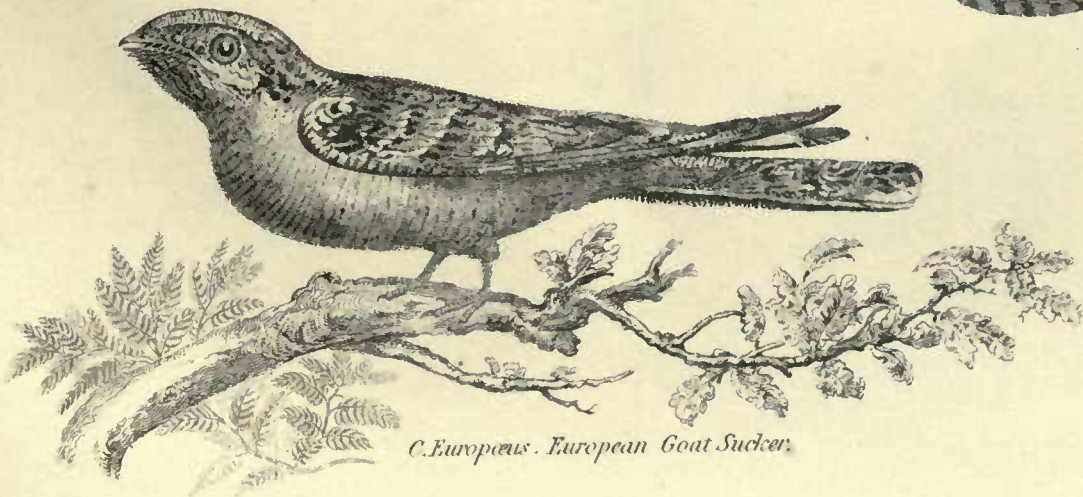
H. Rustica. Chimney Swallow.



C. Macrodipterus. Leona Goat Sucker.



H. Esculenta. Esculent Swallow.



C. Europæus. European Goat Sucker.

Order. Passeres.

AVES.

PLATE. 6

Genera. Sitta, Xenops, Certhia, Tichodroma, Trochilus, Upupa, Merops, Alcedo.

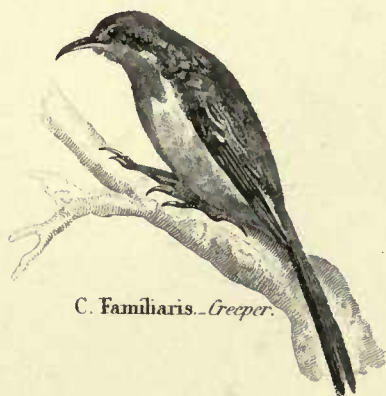
Family. Tenuirostres-Syndactylæ.



S. Europæa... Nuthatch.



X. Rutilans.



C. Familiaris... Creeper.



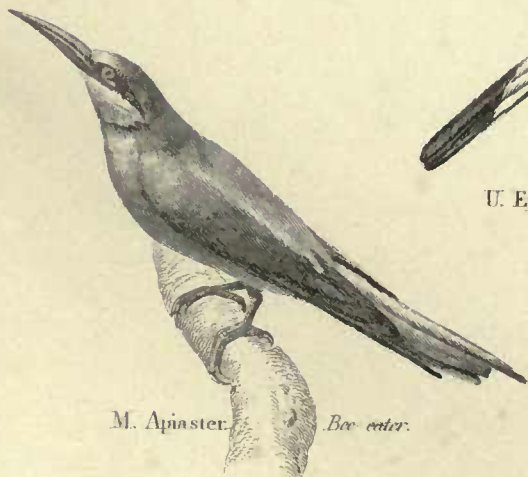
Tichodroma Muraria... Wall Creeper.



Trochilus Delalandi.
Delalande's Humming Bird.



U. Epops... Hoopoe.



M. Apiaster... Bee-eater.



A. Isidra... Kingfisher.

Order: Scansores

AVES.

PLATE 7.

Genera. Galbula, Picus, Yunc, Picumnus.

Family. Zygodactylæ.



G. Macroura. Long-tailed Jacamar.



G. Grandis. Great Jacamar.



P. Martins.
Great Black Woodpecker.



P. Tridactylus. Southern three-toed Woodpecker.



Y. Torquilla. Wrenneck.



Picum? Minutissimus.

How fine delin!

J. W. Lowry sculp!

AVES.

PLATE 8.

Order. Scansores.

Genera. Ava seu Macroceros, Conurus, Psittacula, Psittacus, Plectolophus, Microglossus.

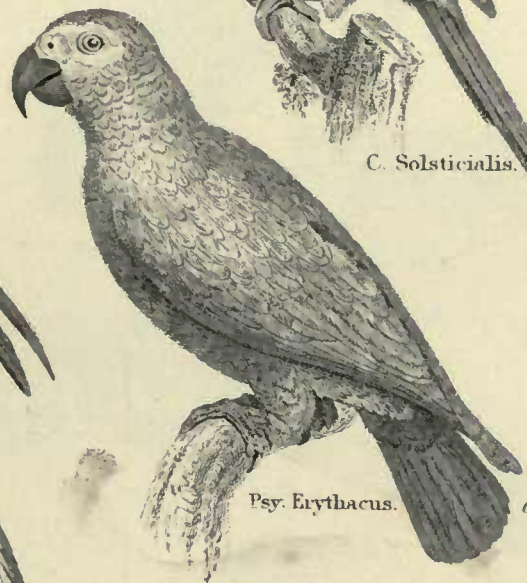
Family. Psittacida.



M. Aracanga. Scarlet Macaw.



C. Solstitialis. Angola Yellow Parakeet.



Psy. Erythacus. Grey Parrot.



Psitt. Pileatus. Bonneted Psittacule.



Plect. Nasicus. Long-nosed Cockatoo.



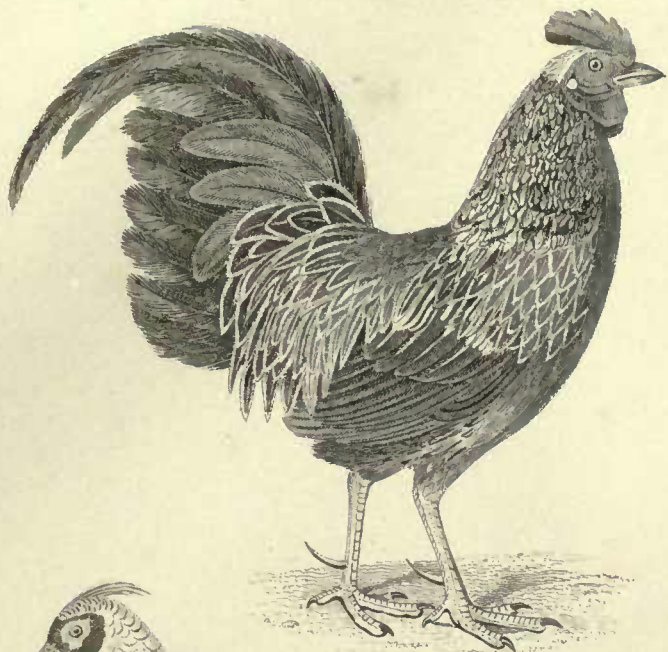
M. Goliath. Grey Small-tongued Parrot.

Order. Gallinae

AVES.

Genera. Gallus, Phasianus, Tragopan, Cryptonyx.

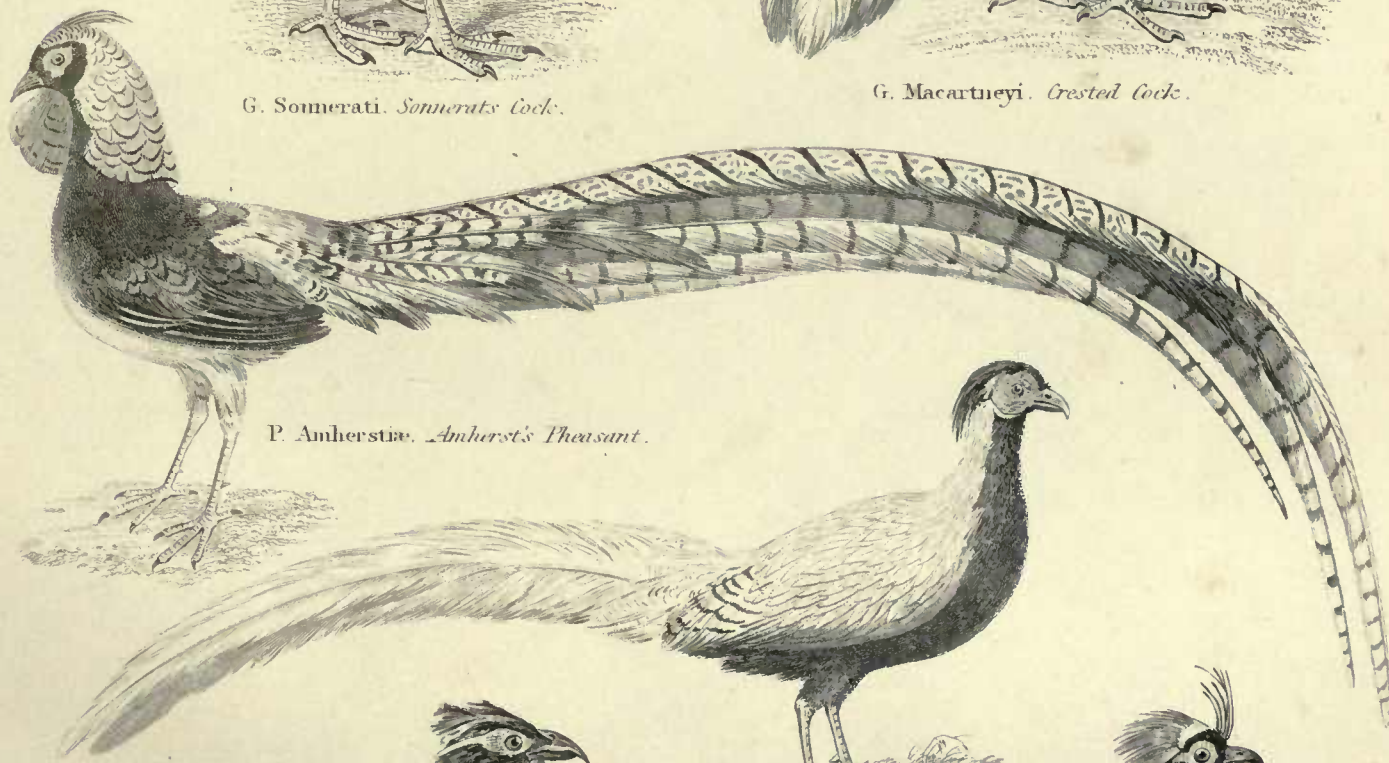
PLATE 9.
Family. Gallidae.



G. Somerati. *Somerati's Cock.*



G. Macartneyi. *Crested Cock.*



P. Amherstiae. *Amherst's Pheasant.*



P. Nycthemerus. *Silver Pheasant.*



T. Satyrus. *Nepal Horned Pheasant.*



C. Coronatus.

AVES.

Order: Gallinae.

Genera: Columba, Vinago.

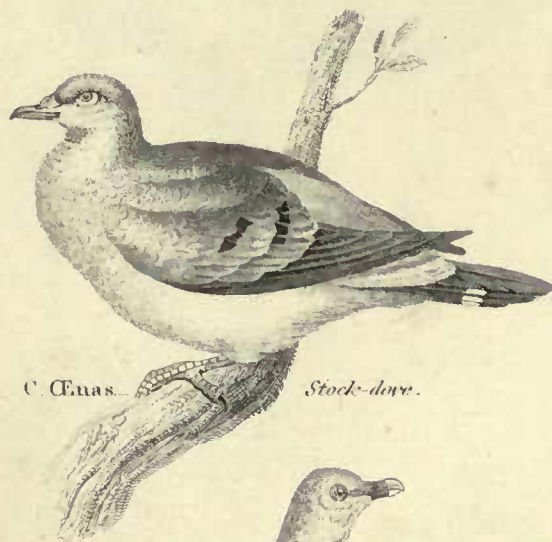
Family: Columbidae.



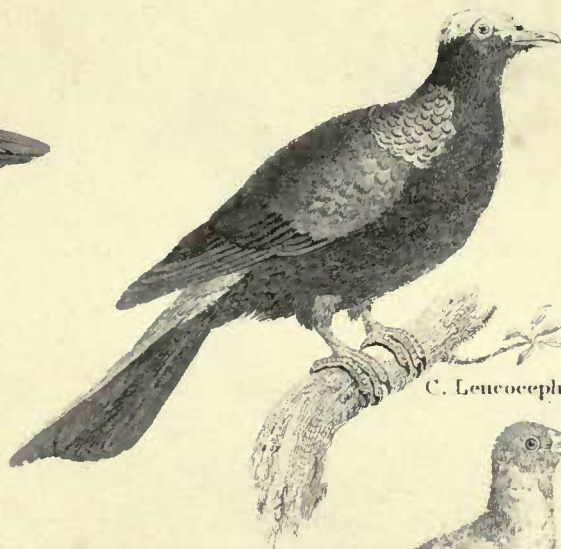
C. Carunculata. Carunculated Pigeon.



C. Coronata. Crowned Pigeon.



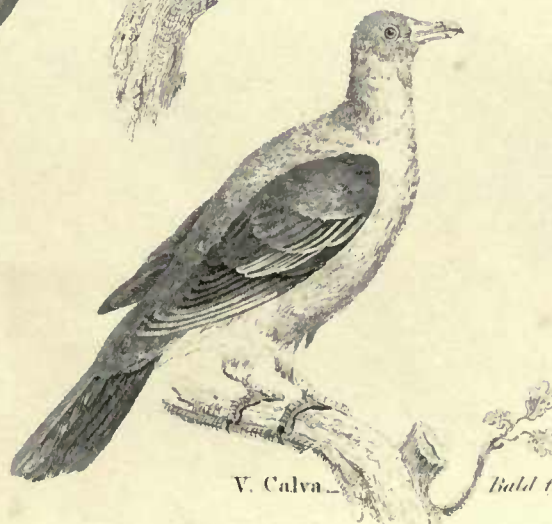
C. Ceras. Stock-dove.



C. Leucocephala. White-headed Pigeon.



V. Wallia. Abyssinian Pigeon.



V. Calva. Bald-fronted Pigeon.

Order: Gralle.

AVES.

PLATE II.

Genera. Struthio, Rhea, Casuarus, Dromiceus

Family. Brevipennes



S. Camelus. Ostrich.



R. Americana. Nandu.



C. Galeatus. Casowary.



D. Ater. Emu.

AVES.

PLATE 12

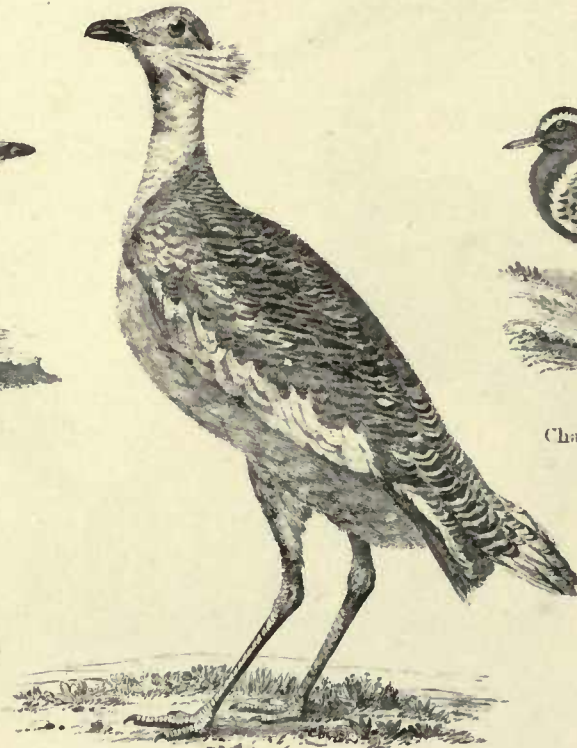
Order: Grallae.

Genera: Otis, Oedicnemus, Charadrius, Vanellus, Haematopus, Cursorius, Dicholopius.

Family: Pressirostris.



O. Crepitans.—Common Thick-knee.



O. Tarda.—Great Bustard.



Char. Hiemalis.—Golden Plover.



V. Melanogaster.—Grey Sand-piper.



H. Ostralegus.—Pied Oyster-catcher.



Cur. Chaleopterus.—Bronze-winged Courser.



D. Cristata.—Margarine's Curlew.

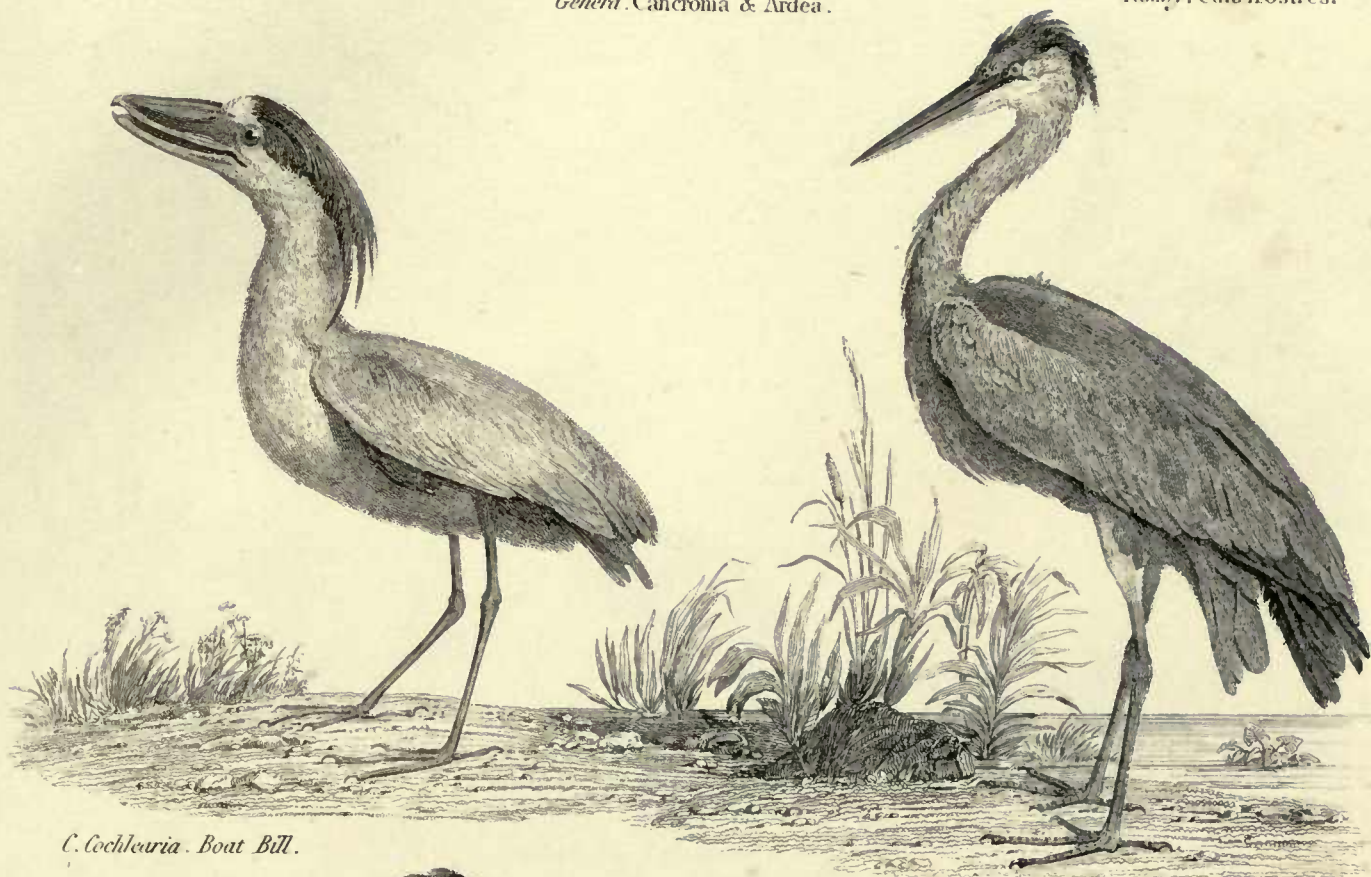
AVES.

Plate 13.

Order. Grallce.

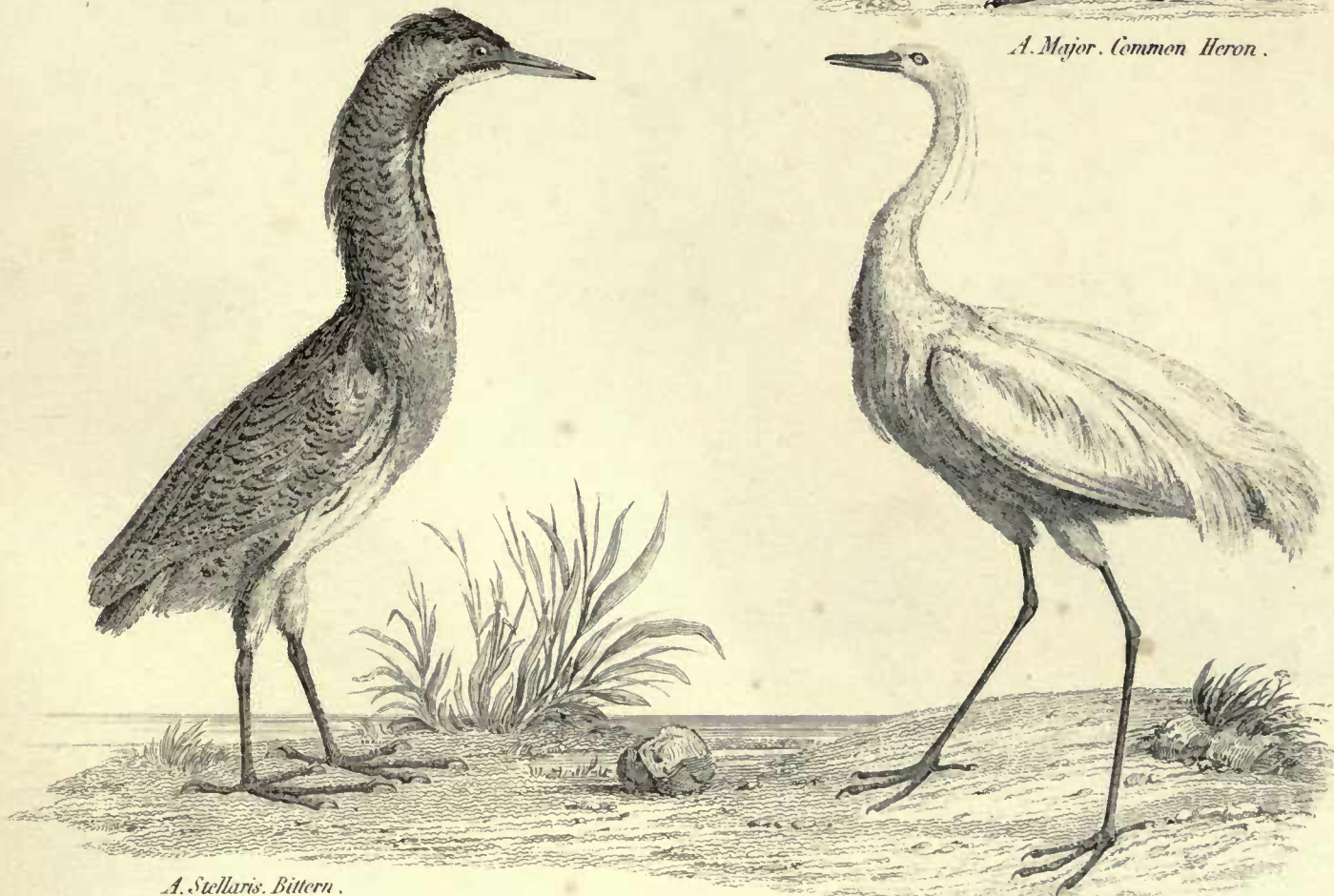
Genera. Cancroma & Ardea.

Family. Cultrirostres.



C. Cochleuria. Boat Bill.

A. Major. Common Heron.



A. Stellaris. Bittern.

A. Egretta. Great Egret.

Order. Grallæ.

AVES.

Genera. Ciconia, Mycteria, Scopus, Anastomus, Tantalus, Platalea.

PLATE 14.
Family. Cultrirostres.



C. Alba... White Stork.



S. Umbretta... Tufted Umbre.



M. Senegalensis... Senegal Jabiru.



Platalea Ajaja... Roseate Spoonbill.



T. Lactens... Milky Tantalus.



A. Lamelligerus... Coromandel Erodia.

J. W. Lowry Sculp.

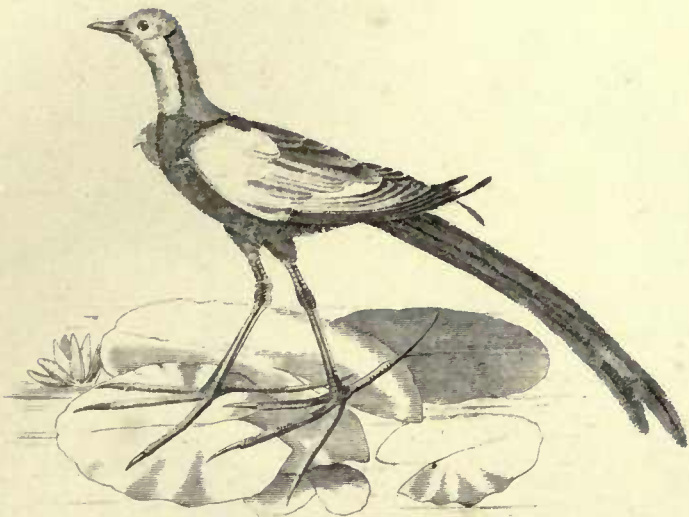
AVES.

PLATE 15.

Order: Grallæ.

Genera. Parra, Palamedea, Megapodius, Porphyrio, Chionis, Glareola, Phœnicopterus.

Family: Macrodytyle.



Parr. Chinensis. — Chinese Jacana.



Pal. Cornuta. — Horned Screamer.



M. Freycineti. — Freycinet's Manikin.



Phœn. Ruber. — Red Flamingo.



Porph. Pulverulentus.
Sultana-bird.



C. Necrophaga. — White Sheathbill.



G. Torquata. — Collared Pintail.

AVES.

PLATE 15.

Order. Palmipedes.

Genera. Podiceps, Podoa, Colymbus, Fratrcula, Alca, Aptenodytes.

Family. Brachypteres.



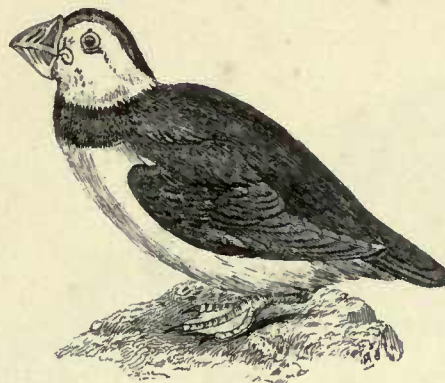
C. Glacialis — Northern Diver.



P. Cornutus — Horned Grebe.



Podoa Senegalensis — Senegal Coot-grebe.



F. Mormon — Puffin.



Al. Impennis — Great Auk.



Apt. Patagonica — Patagonian Penguin.

Order. Palmipedes.

AVES.

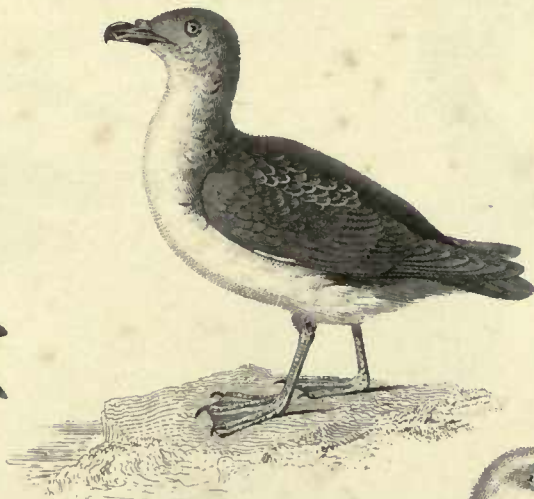
PLATE 17.

Gen. Procellaria, Haladroma, Pachypūla, Diomedea, Larus, Rhyncops.

Family. Longipennes.



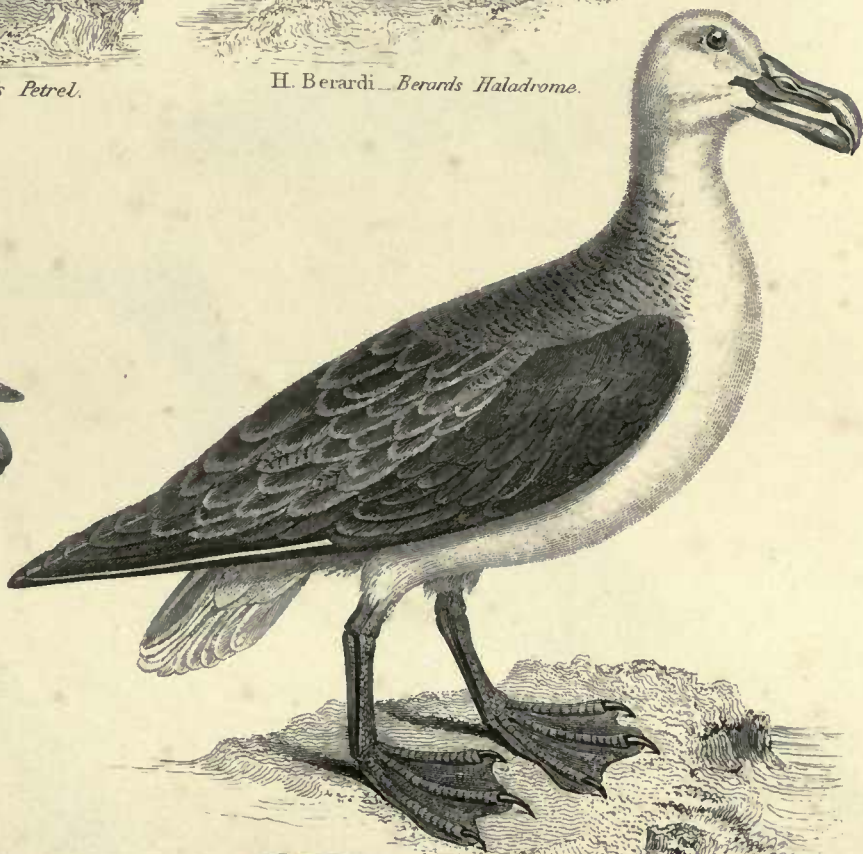
Proc. Hartie — Hartie's Petrel.



H. Berardi — Berardi's Haladrome.



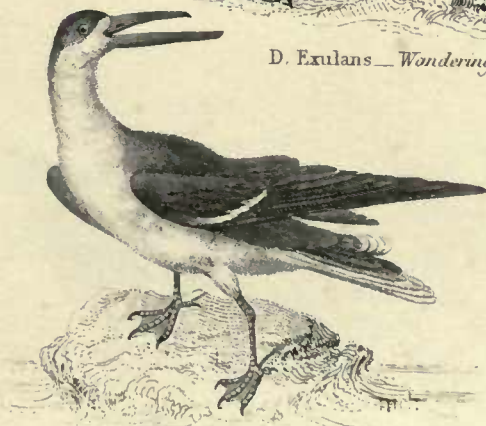
Pach. Vittata — Broadbilled Prion.



D. Exulans — Wandering Albatross.



L. Marimus — Blackbacked Gull.



R. Nigra — Black Skimmer.

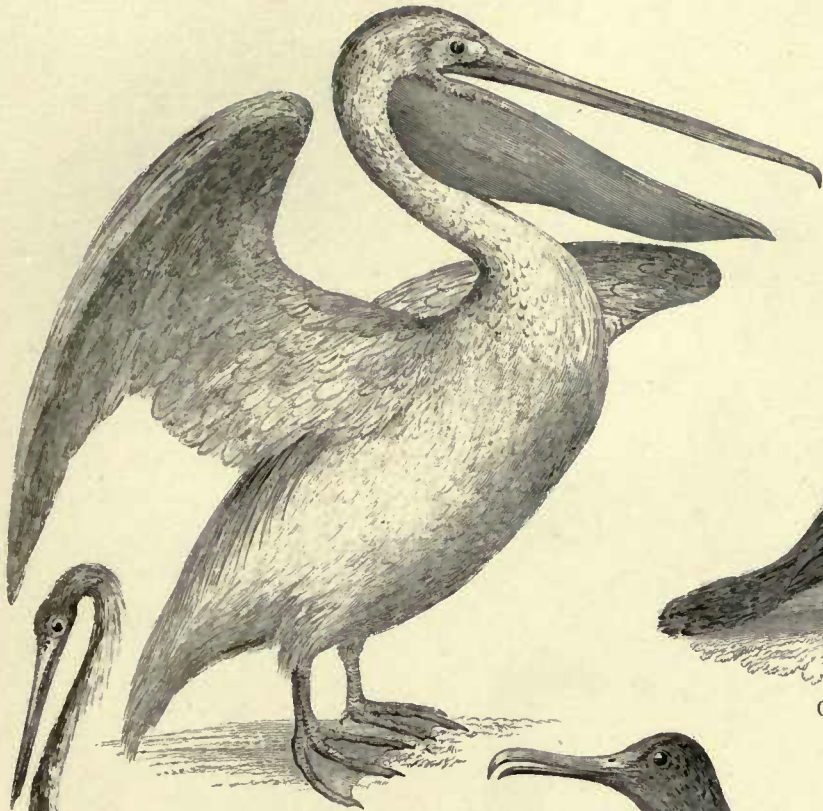
AVES.

PLATE 18.

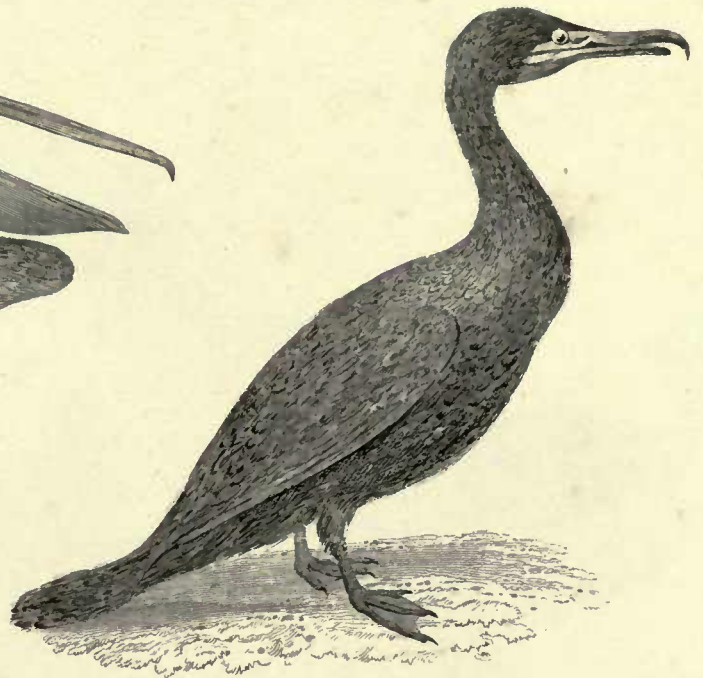
Order. Pehmpedes.

Gen. Pelecanus, Carbo, Tachypetes, Sula, Plotus, Phaeton.

Family. Steganopodes.



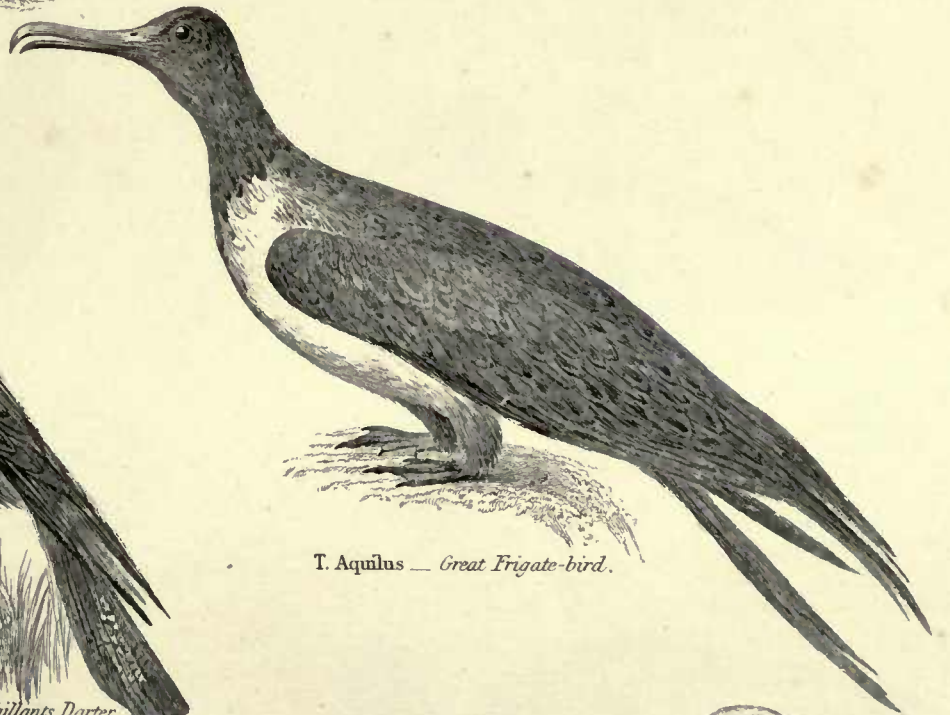
Pel. Onocrotalus — Common Pelican.



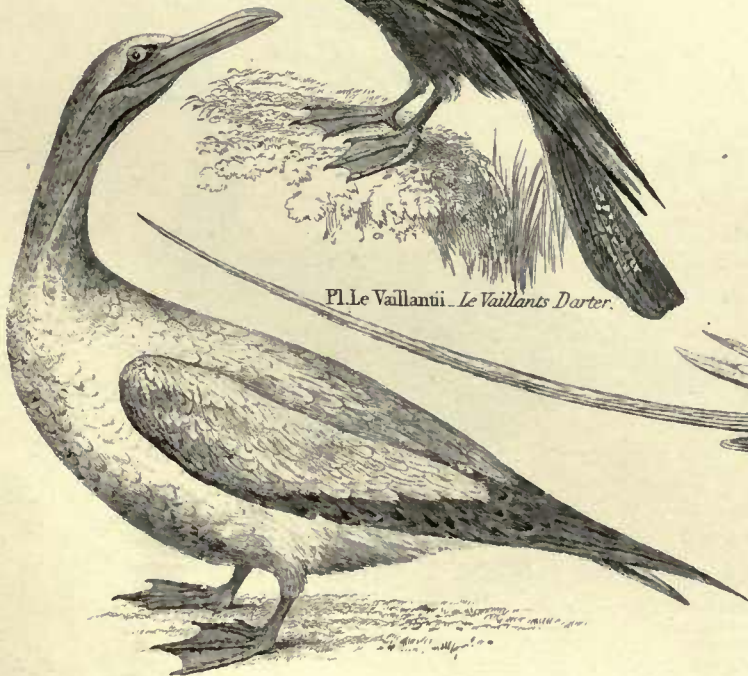
C. Cormorantus — Cormorant.



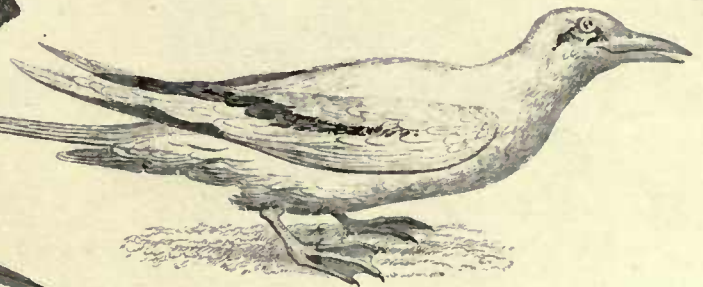
Pl. Le Vaillantii — Le Vaillant's Darter.



T. Aquilus — Great Frigate-bird.



S. Alba — White Gannet.



P. Phoenicurus — Red-tailed Tropic-bird.

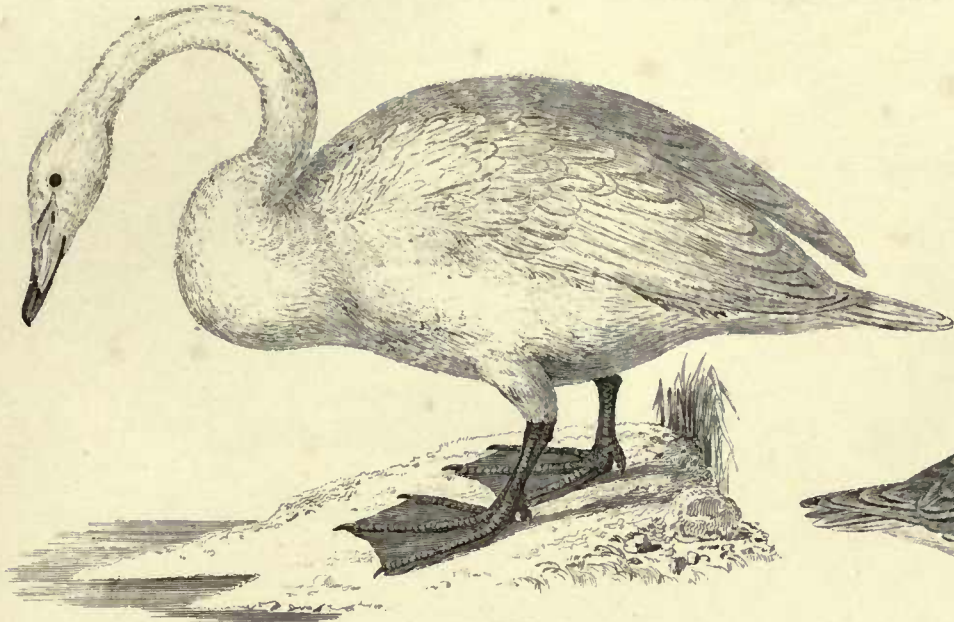
Order. Palmipedes.

AVES.

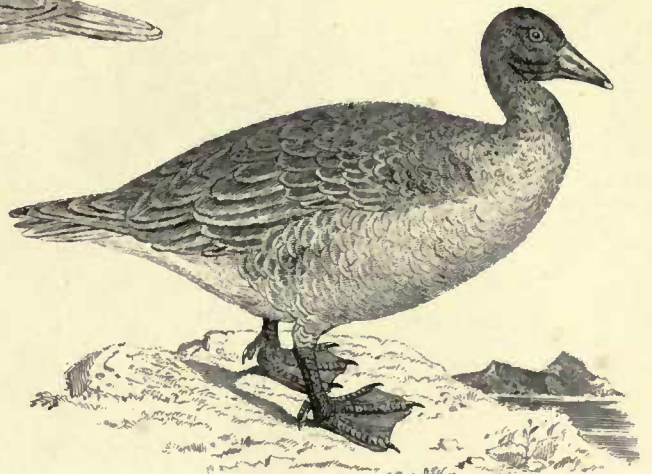
PLATE 19

Genera. Cygnus, Anser, Cereopsis, Anas, Hydrobates, Mergus.

Family. Lamellirostres.



C. Musicus — Wild Swan.



Ans. Feras — Wild Goose.



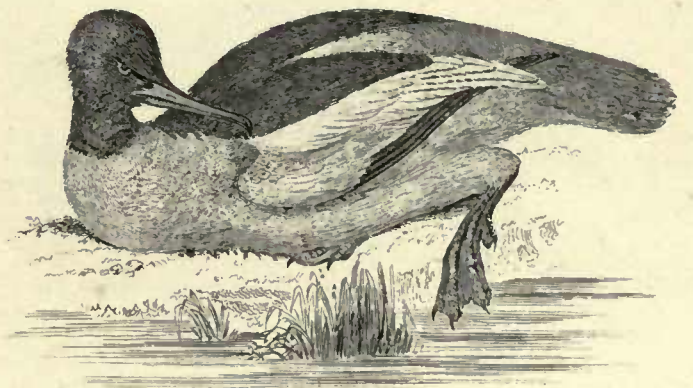
Cer. Novae Hollandiae — New Holland Pigeon Goose



An. Clypeata — Shoveller.



H. Lobatus — Lobated Duck.



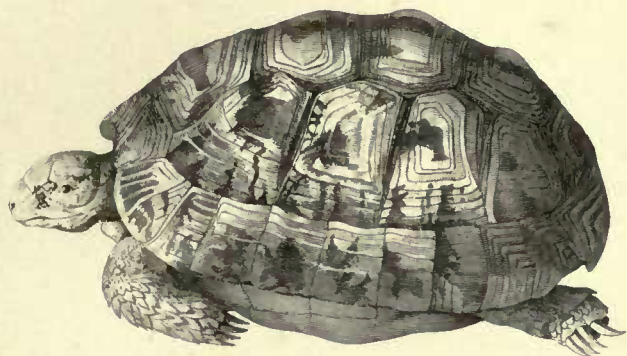
M Merganser — Goosander.

Order Chelonia

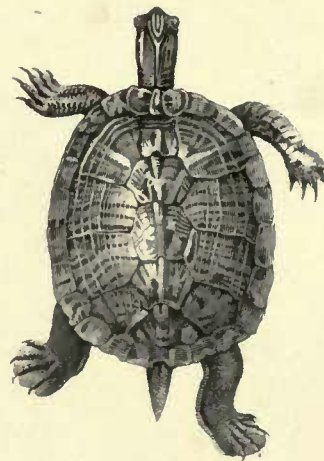
REPTILIA

Plate I

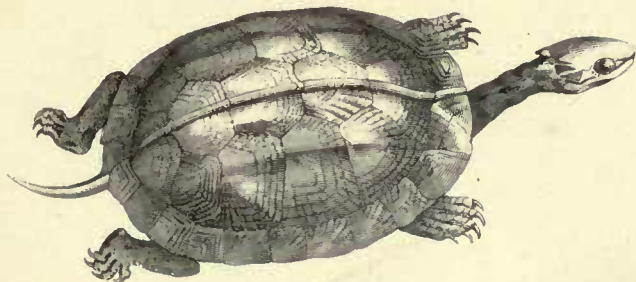
Genera Testudo, Emys, Sternotherus, Chelonia, Chelys, Trionyx.



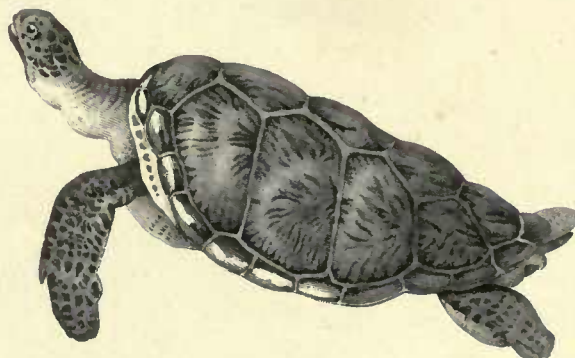
T. Graeca. Common Tortoise



E. Scripta. Written Tortoise.



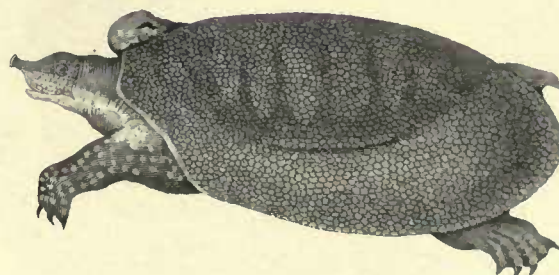
S. Trifasciatus. Three striped Box Tortoise



C. Virgata. Striped Tortoise



C. Matamata. Fimbriated Tortoise



T. Niloticus. Nilotic three toed Tortoise



Elongation of the snout

Chas Pyne delin.

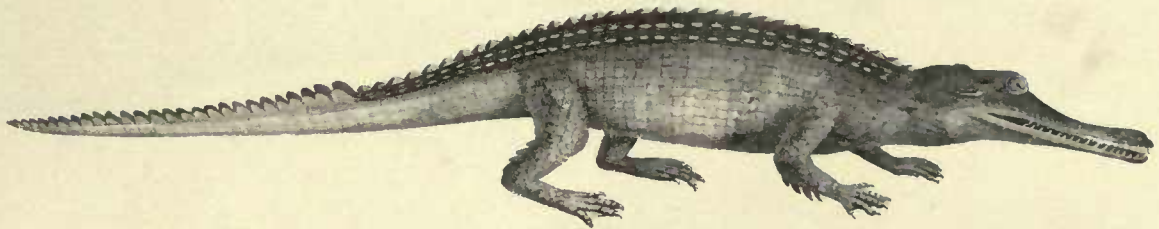
J.W Lowry, sculp.

REPTILIA

Plate 2

Order Champsia.

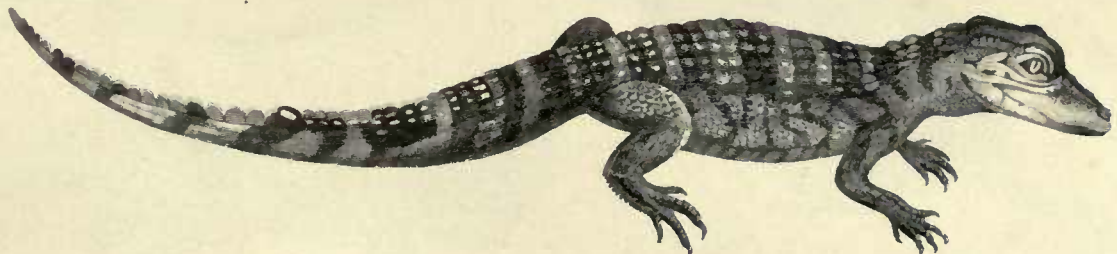
Genera. Champsia, Crocodilus, Rhamphostoma.



1. *G. Gangeticus*. Indian Crocodile or Gavial.



2. *Cro. Vulgaris*. Nilotic Crocodile



3. *Ch. Sclerops*. Spectacled Alligator



1

Heads of the above



2



3

REPTILIA

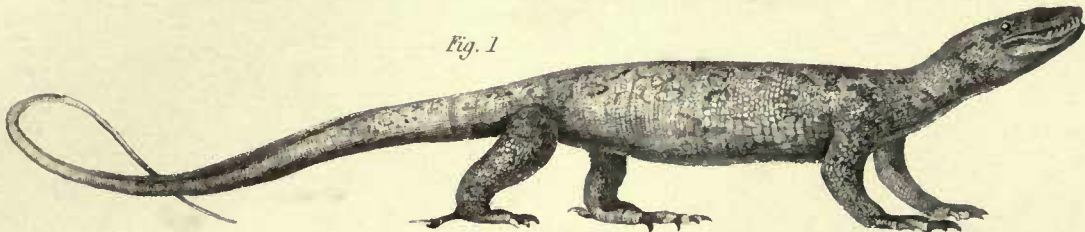
Plate 3

Order, Sauria

Family { Lacertida
Iguanida

Genera, Tupinambis, Lacerta, Stellio, Draco, Iguana, Anolis.

Fig. 1



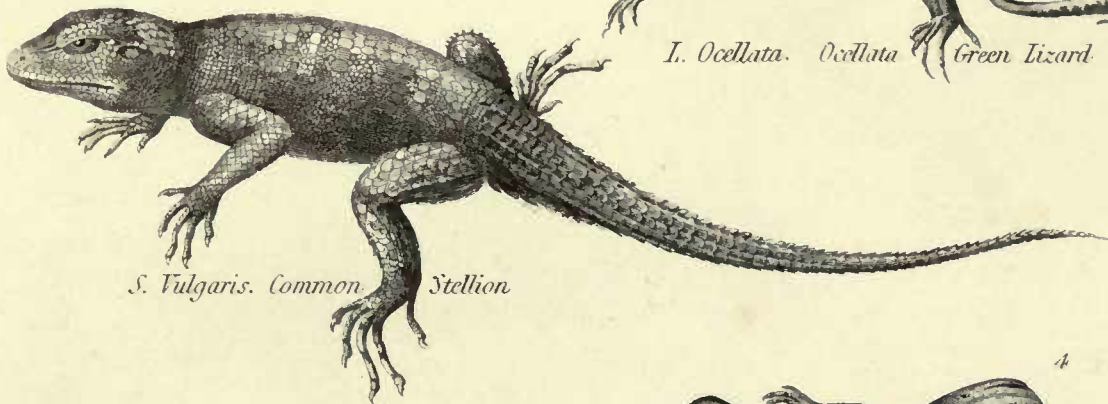
T. Nilotica. Nilotic Ouaran

2



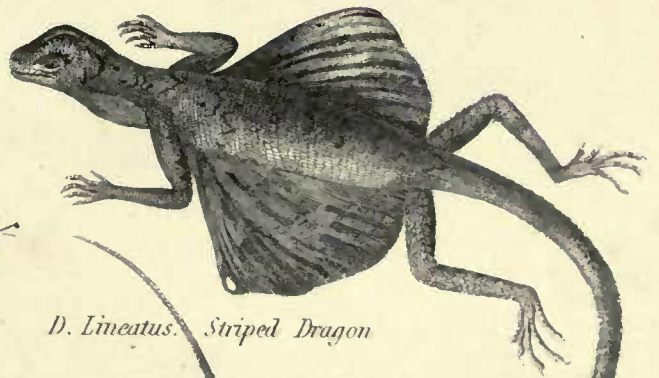
I. Ocellata. Ocellata Green Lizard

3



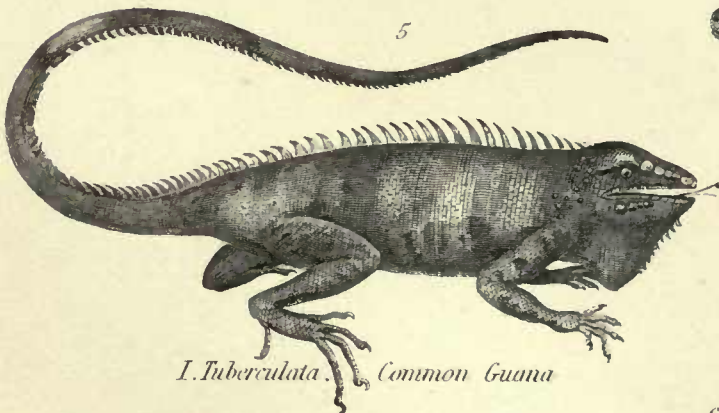
S. Vulgaris. Common Stellion

4



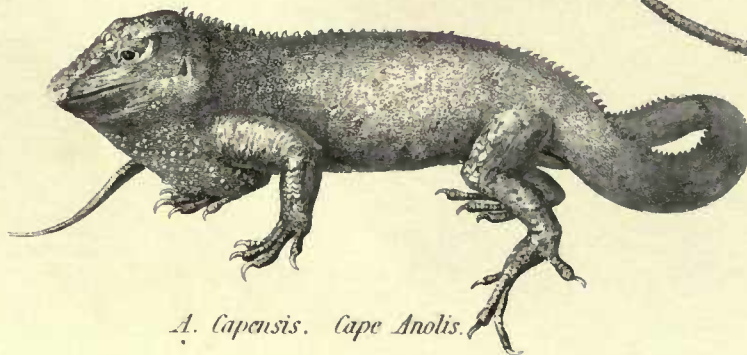
D. Lineatus. Striped Dragon

5



I. Tuberculata. Common Guana

6



A. Capensis. Cape Anolis

REPTILIA.

Order Sauria

Fam. Geckotida. Chamælonida. Scincoida.

Gen. Gecko Chamælio. Scincus, Seps, Bipes, Chirotes.



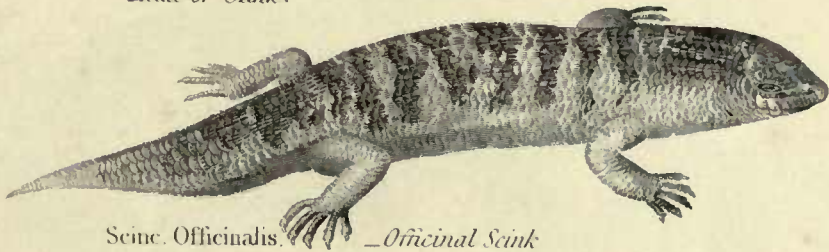
Gecko Aegyptiacus. Egyptian Gecko.



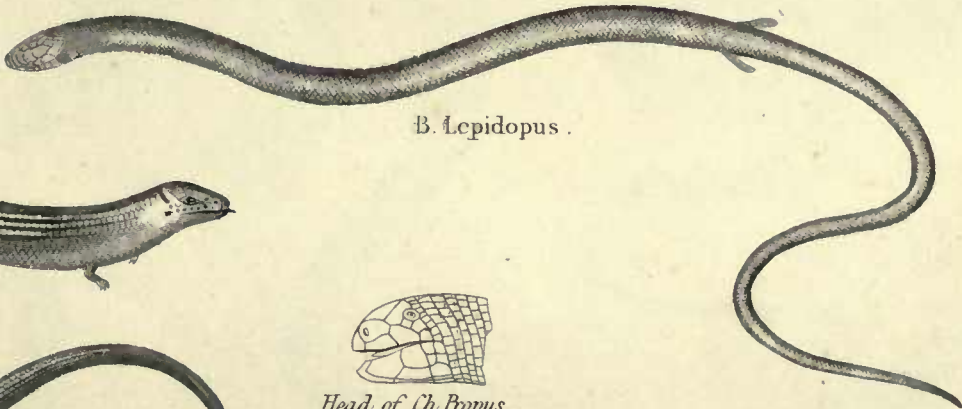
Cham. Vulgaris — Common Chameleon.



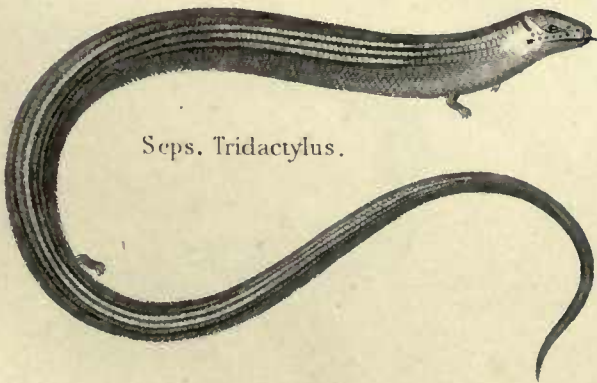
Head of Scink.



Scinc. Officinalis. — Official Scink



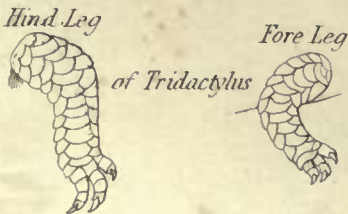
B. Lepidopus.



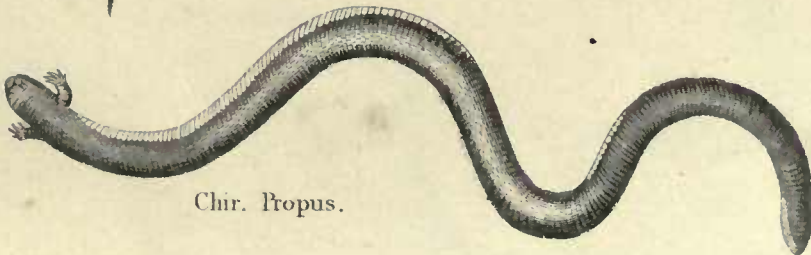
Seps. Tridactylus.



Head of Ch. Propus.



Hind Leg of Tridactylus Fore Leg



Chir. Propus.

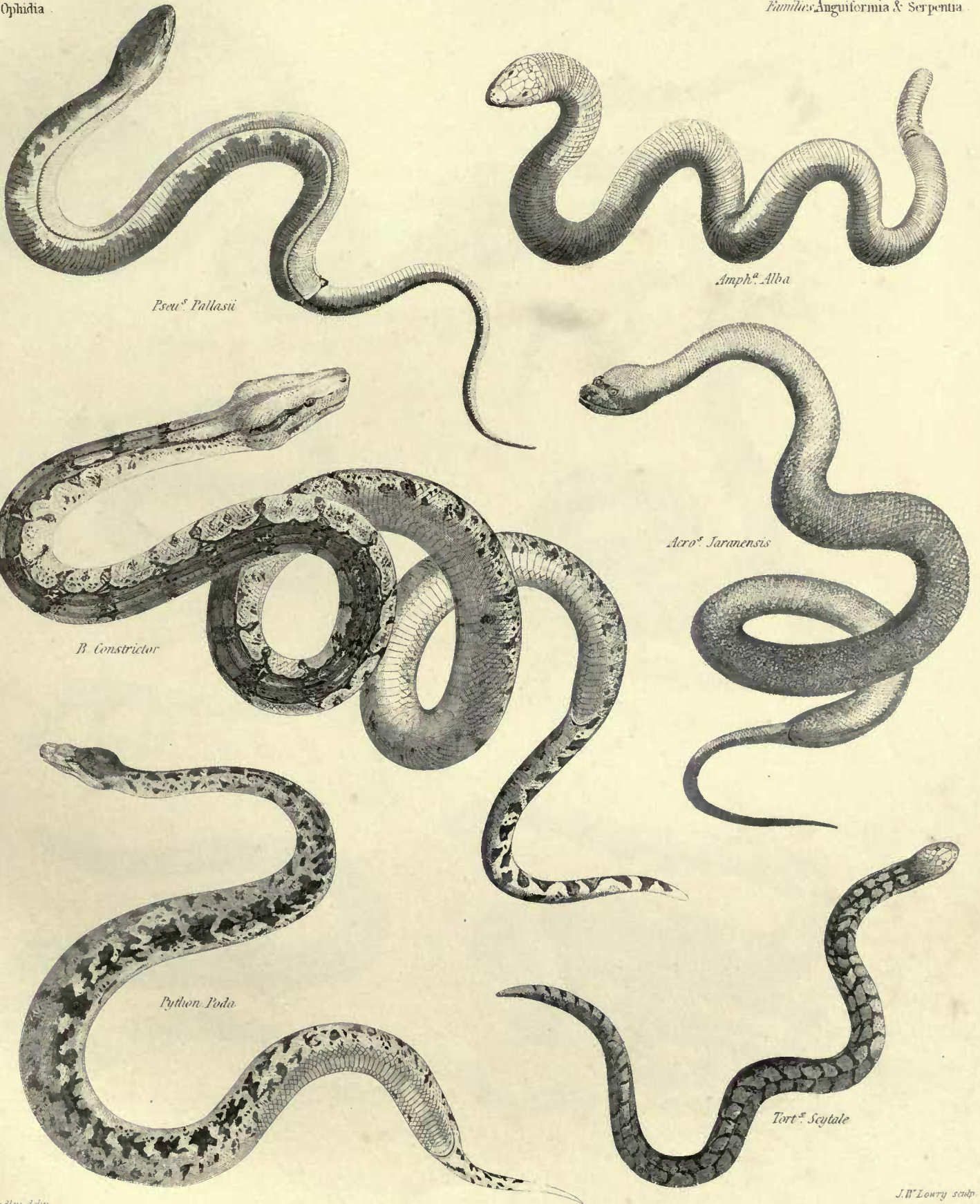
REPTILIA

PLATE, 5.

Order, Ophidia

Genera: Pseudopus, Amphisbana, Tortrix, Boa, Python, Acrochordus.

Families: Anguiformia & Serpentina.



G. Bradley delin.

J. W. Lowry sculp.

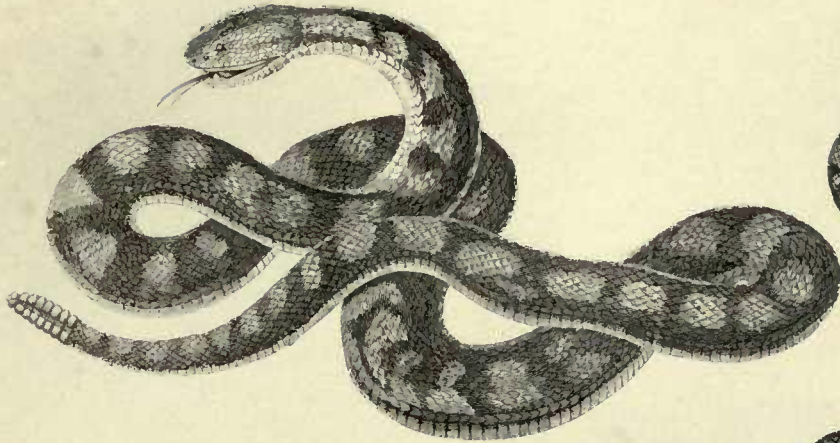
REPTILIA

PLATE, 6.

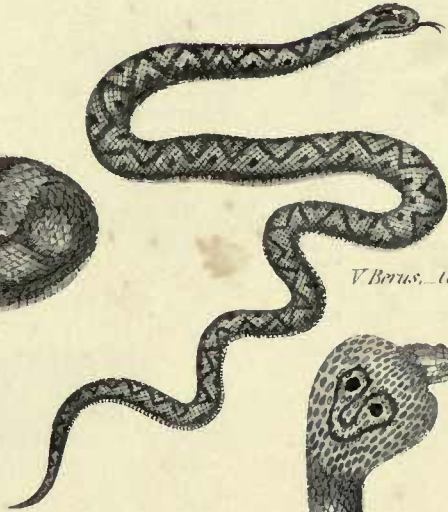
Genera. Crotalus, Vipera, Cerastes, Naja, Trimeresurus, Pelamides, Pseudoboa, Cæcilia

Order, Ophidia

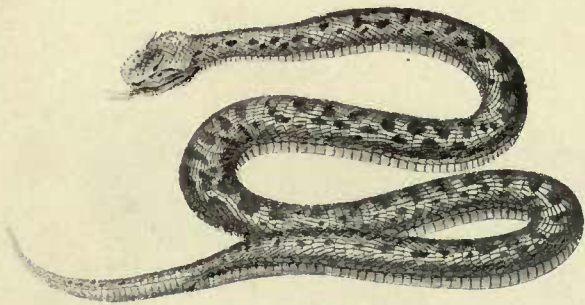
Family, Venenosa, Nuda.



Crot. horridus. — Banded Rattle Snake



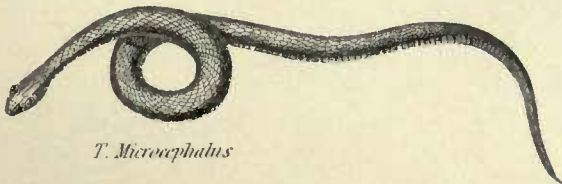
V. Berus. — Common Viper



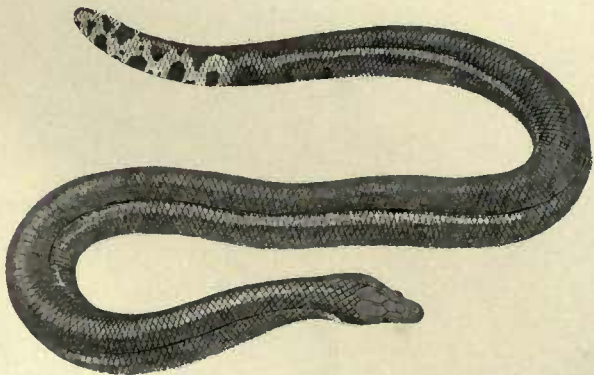
Cera. Hasselquistii



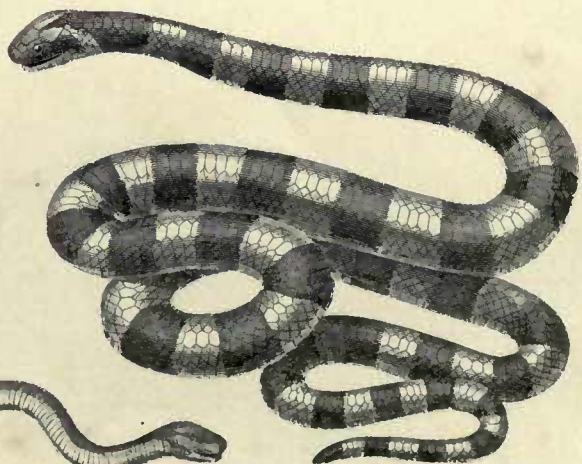
N. Lutescens. — Spotted Snake



T. Microcephalus



Pel. Bicolor. — Blackbacked Sea Snake



Pseud. Fasciata



Cæc. Glutinosa

J.D. Sowerby delin.

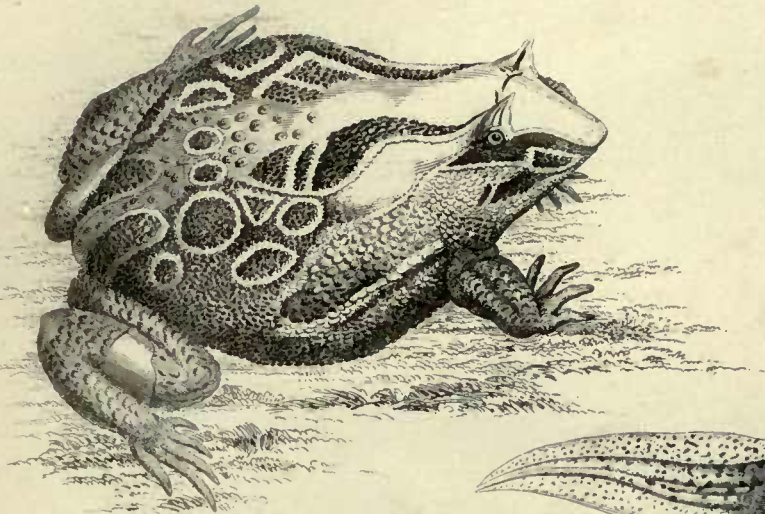
J.W. Lowry sculp.

REPTILIA

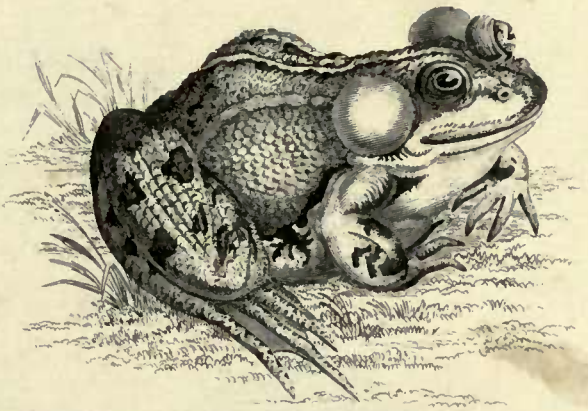
Order: Batrachia.

Genera. Rana, Ceratophis, Hyla, Bufo, Pipa.

PLATE 7.
Family. Ecaudata.



C. Varius, — Horned Frog.



R. Esculenta, — Edible Frog.



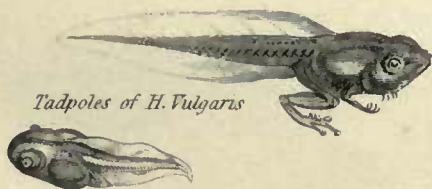
Tadpole of R. Esculenta.



B. Vulgaris, — Common Toad.



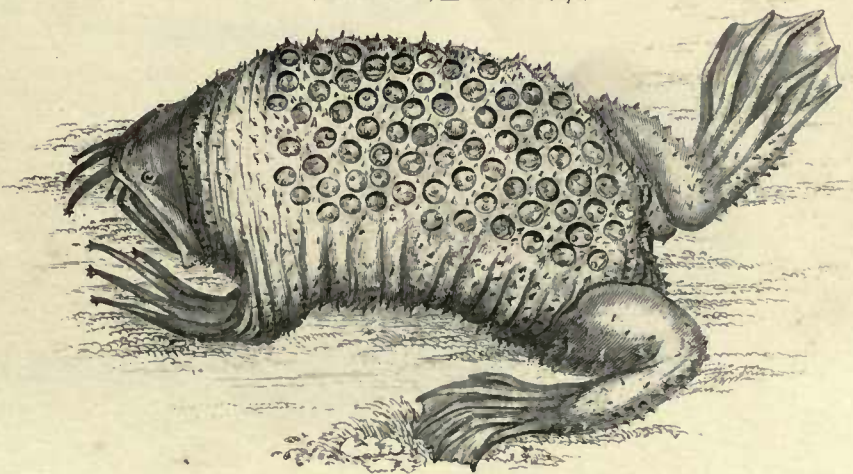
B. Bombina, — Yellow bellied Toad.



Tadpoles of H. Vulgaris

H. Vulgaris — Tree Frog.

P. Surinamensis, — Surinam Pipa.



REPTILIA

Genera. Salamandra, Triton, Salamandrops, Siredon, Proteus, Siren.

PLATE, 8.

Order, Batrachia.

Family, Caudata.



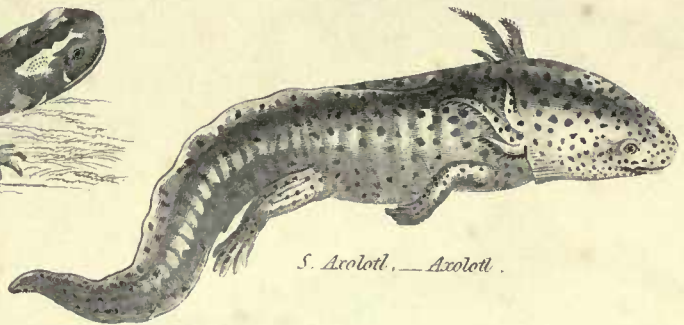
T. Marmorata, — Marbled Newt.



S. Alleghaniensis, — Alleghany Salamandrops.



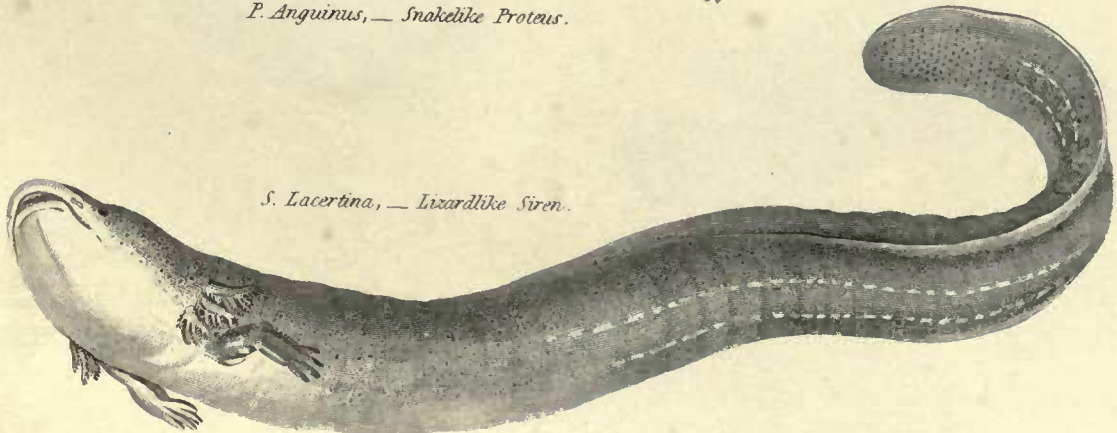
S. Maculosa, — Spotted Salamander.



S. Axolotl, — Axolotl.



P. Anguinus, — Snake-like Proteus.



S. Lacertina, — Lizard-like Siren.

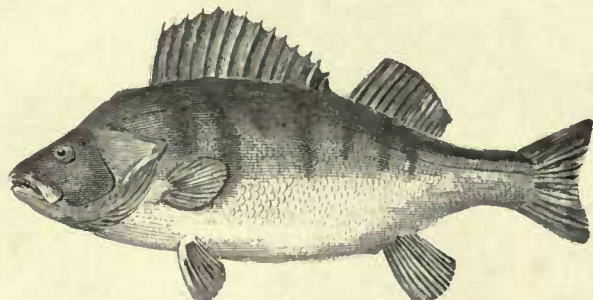
PISCES.

PLATE I.

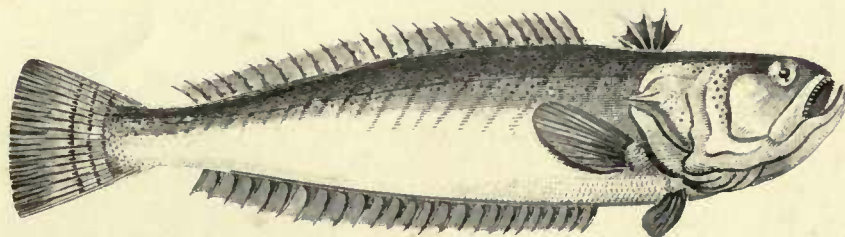
Order: Acanthopterygii.

Family: Percoides Trigloides Scionoides.

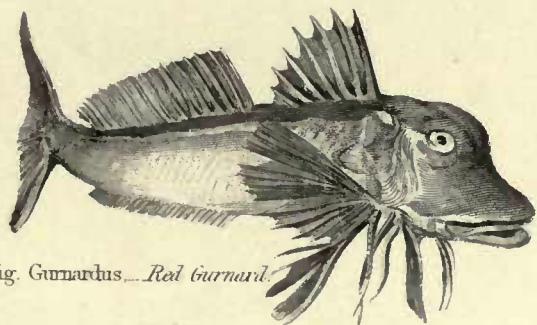
Genera: Perca, Trachinus, Mullus — Trigla, Dactylopterus — Sciaenops, Amphiprion.



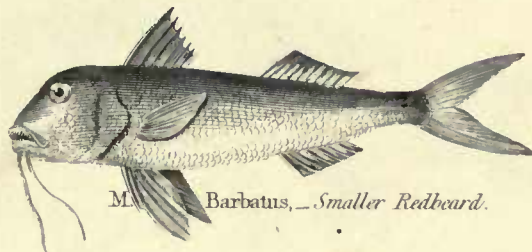
P. fluviatilis, — Perch.



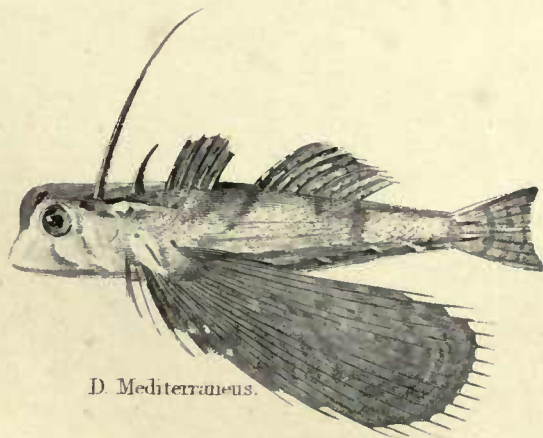
Trach. draco, — Common Weaver.



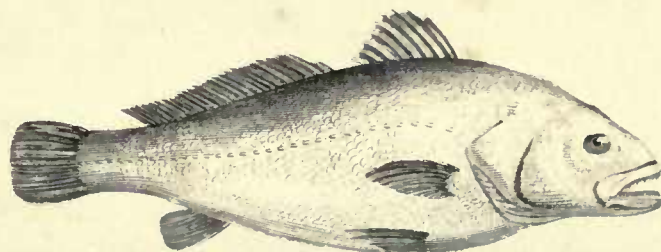
Trig. gurnardus, — Red Gurnard.



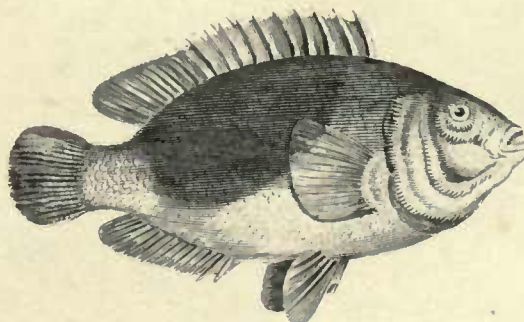
M. barbatus, — Smaller Redbeard.



D. mediterraneus.



S. umbra.



A. ephippium, — Saddlerfish.

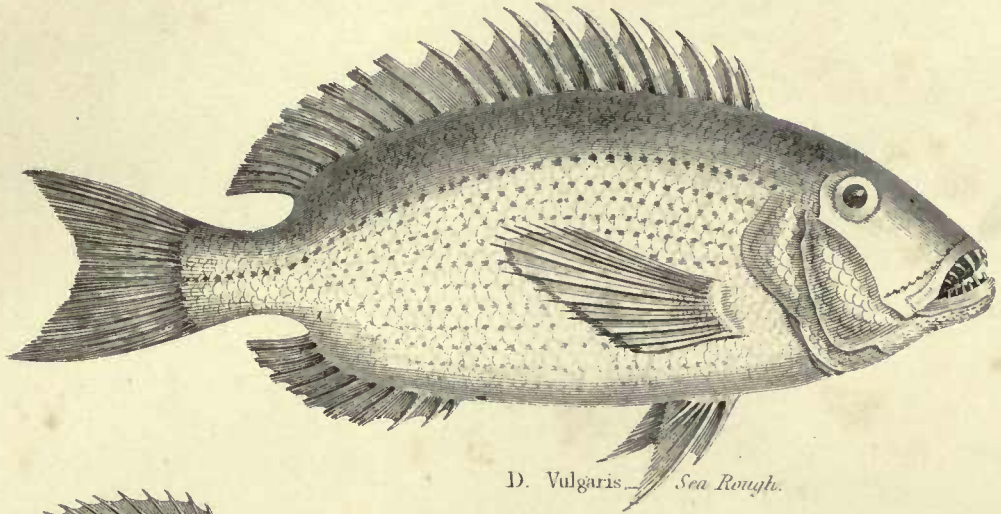
PISCES.

PLATE 2.

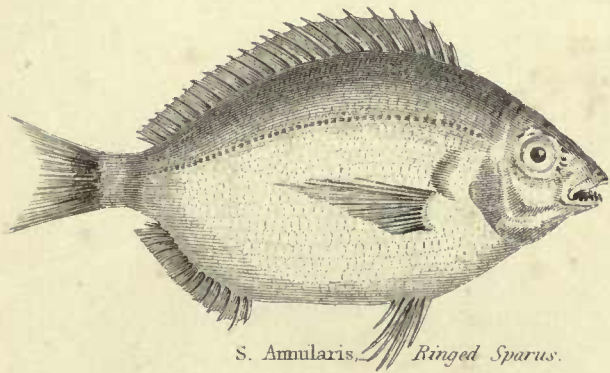
Order: Acanthopterygii.

Gen: Sargus, Dentex, — Maena, Smaris, — Chaetodon, Brama

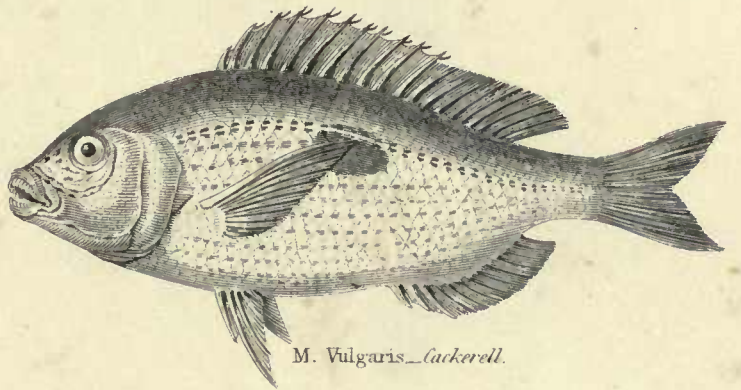
Fam: Sparoides, Maenoides, Squammipennes.



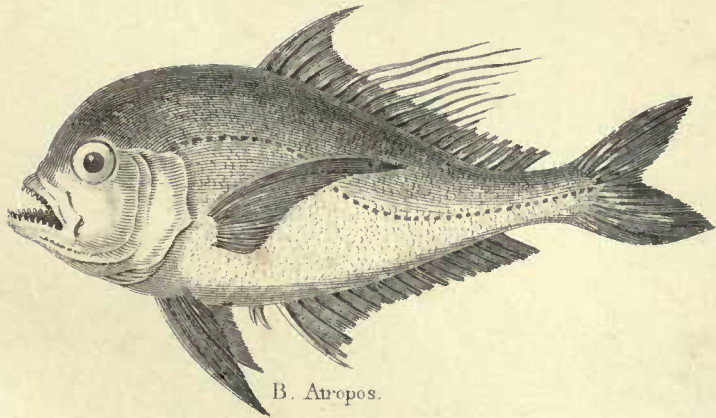
D. Vulgaris — Sea Rough.



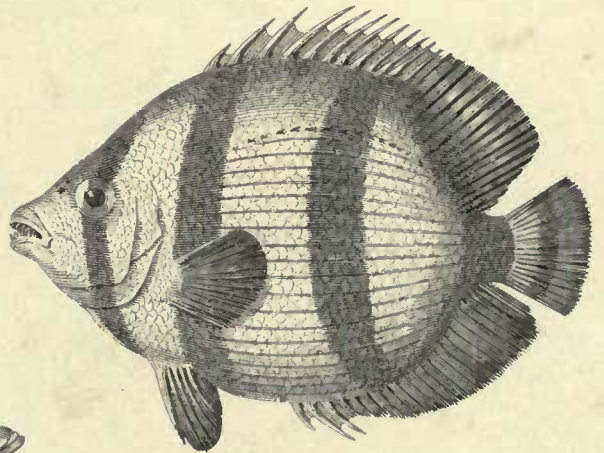
S. Annularis, — Ringed Sparus.



M. Vulgaris — Cackereil.



B. Atropos.



C. Striatus, — Streaked Chaetodon.



Sm. Vulgaris, — Pickarell.

PISCES

PLATE 3.

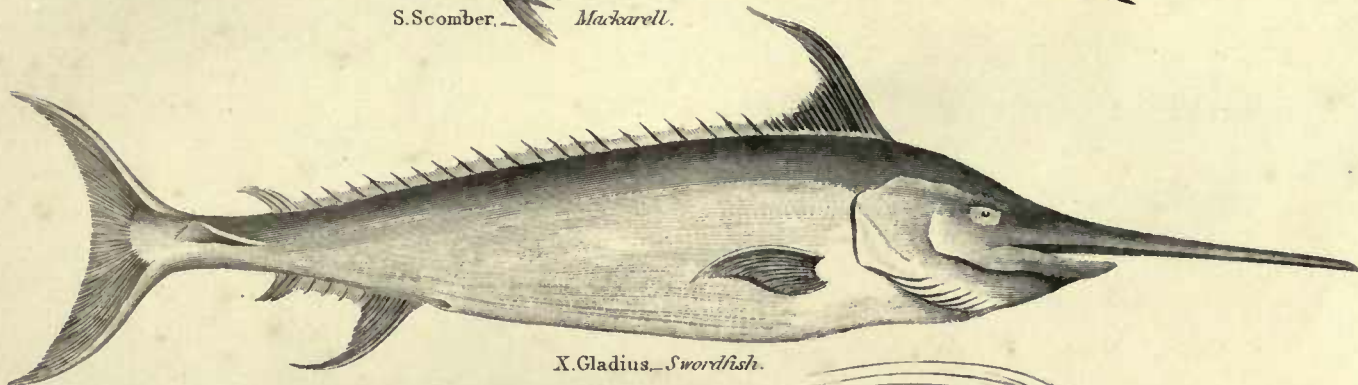
Order. Acanthopterygii.

Fam: Scomberoides, Tænioides, Theutyes.

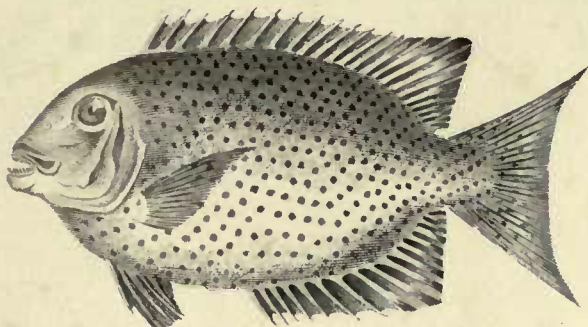
Gen: Scomber, Xiphias, Zeus. — Trichiurus, Stylephorus, Cepola, — Amphacanthus.



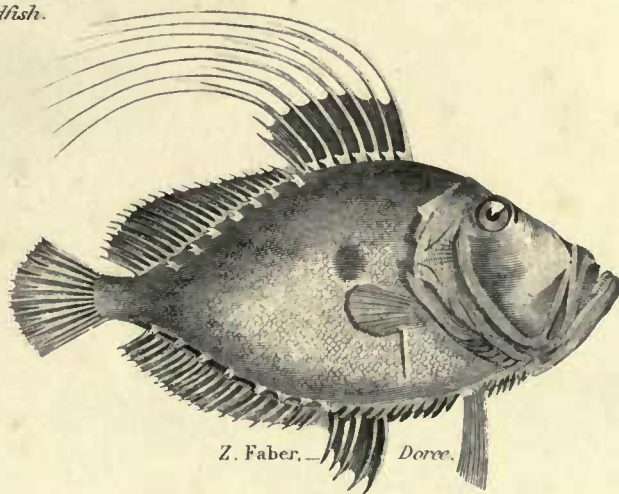
S. Scomber, — Mackerell.



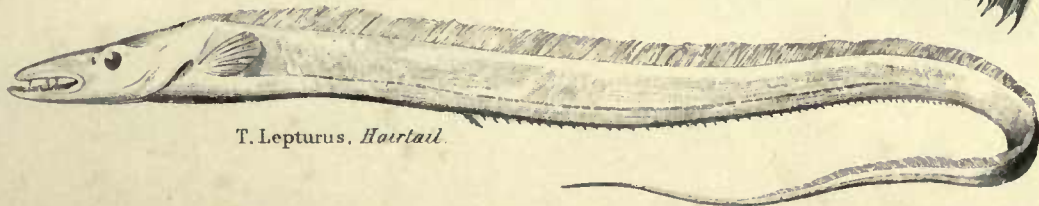
X. Gladius, — Swordfish.



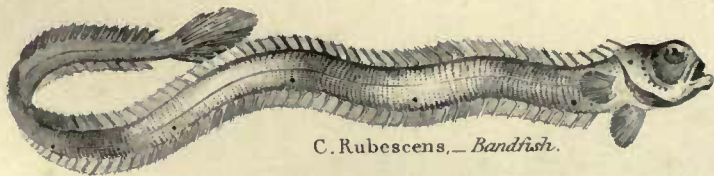
A. Guttatus.



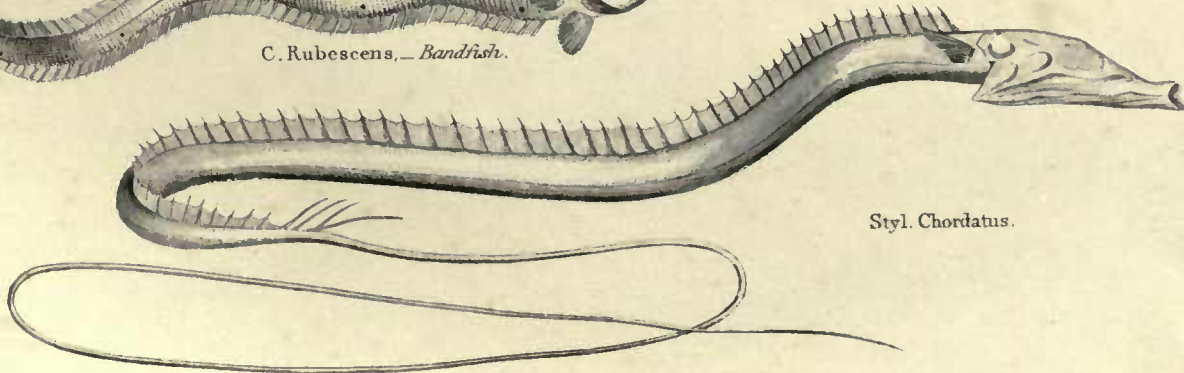
Z. Faber, — Dovee.



T. Lepturus, Hairtail.



C. Rubescens, — Bandfish.



Styl. Chordatus.

PISCES.

PLATE 4

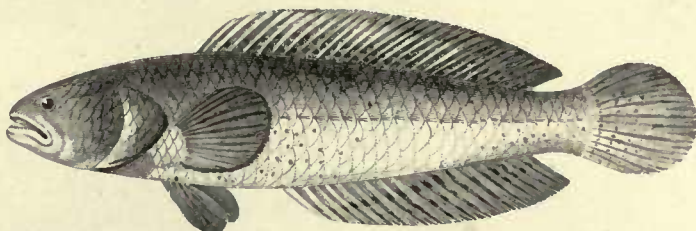
Order: Acanthopterygii.

Family: Labyrinthiformes, Mugiloides, Gobioides.

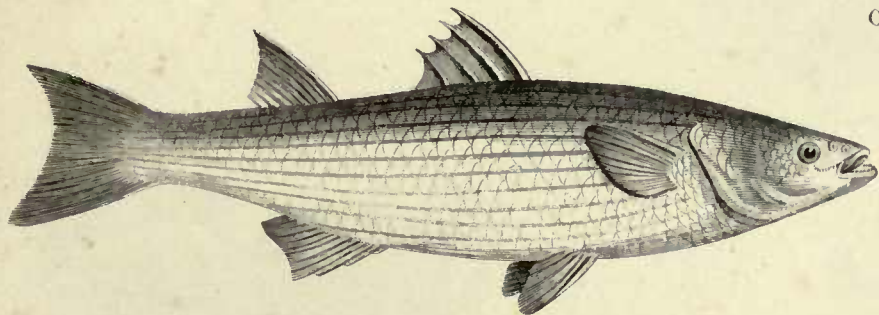
Genera: Anabas, Ophicephalus - Mugil - Blennius, Anarrhichas, Gobioides.



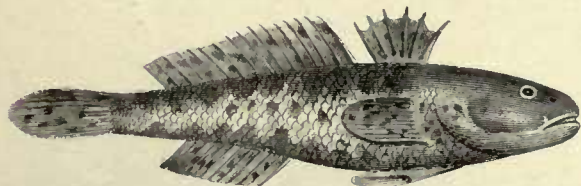
Anab. Testudineus.
Climbing Perch.



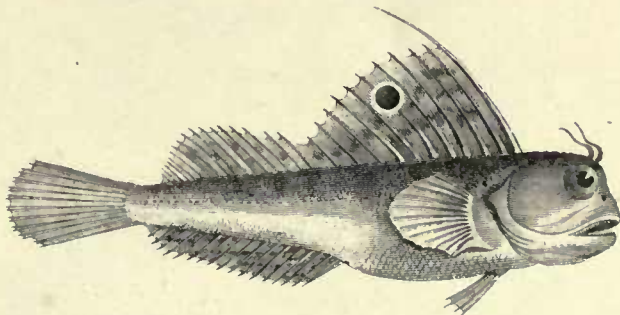
O. Punctatus, Dotted Snakehead.



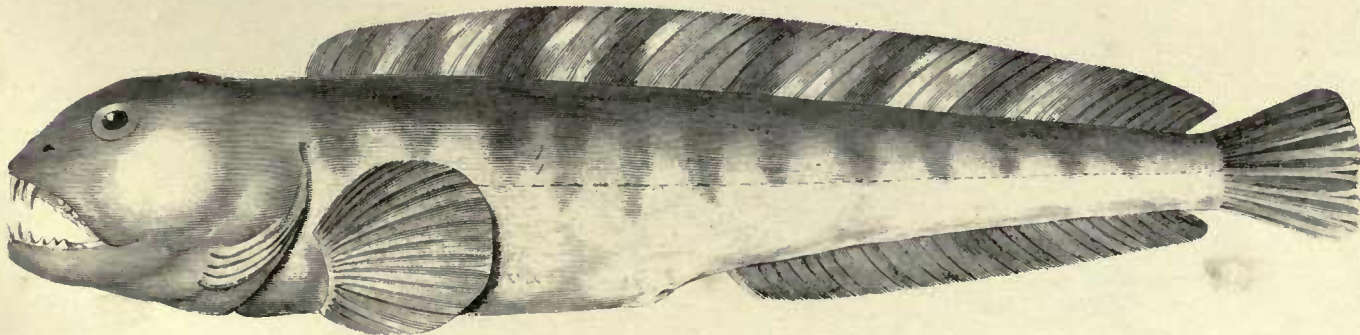
M. Cephalus, Mullett.



G. Niger, Black Goby.



B. Ocellaris, Butterfly-fish.



Anarr. Lupus, Wolf-fish.

F. Howell delin.

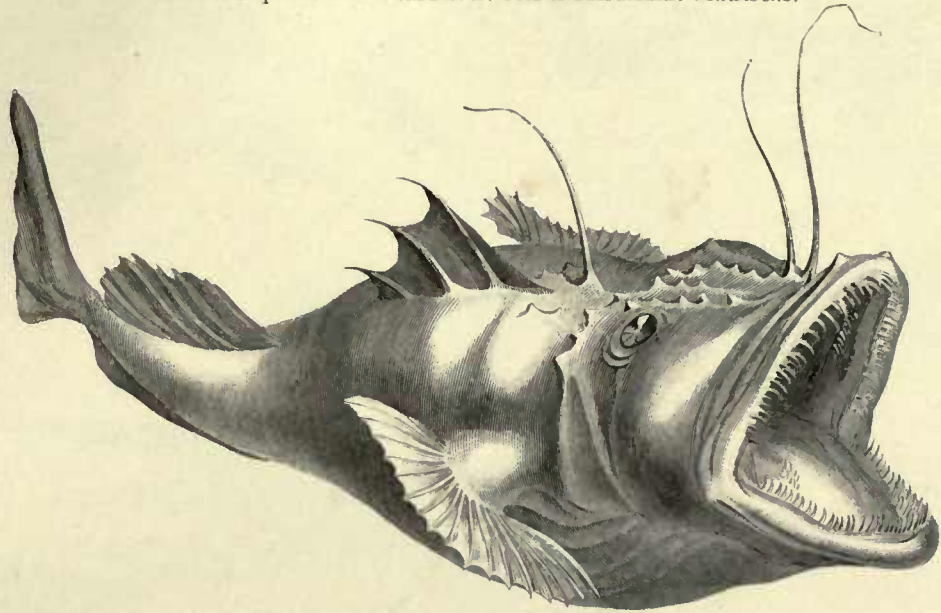
J. W. Leary sculp

PISCES.

Order. Acanthopterygii.

Family: Pectoralipedes. Labroides. Anulostomes.

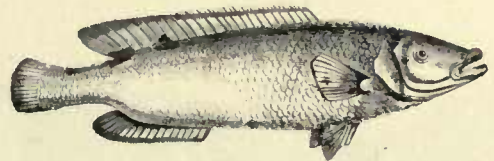
Genera. Lophius. Barachus. Labrus. Scarus. Fistularia. Centriscus.



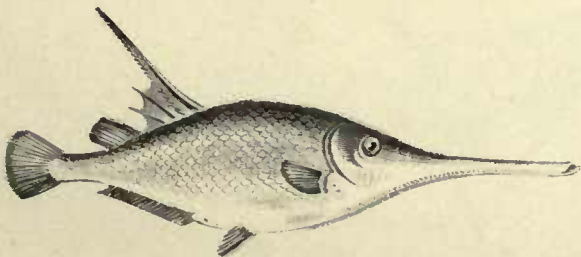
Loph. Hiscatorius - Common Angler.



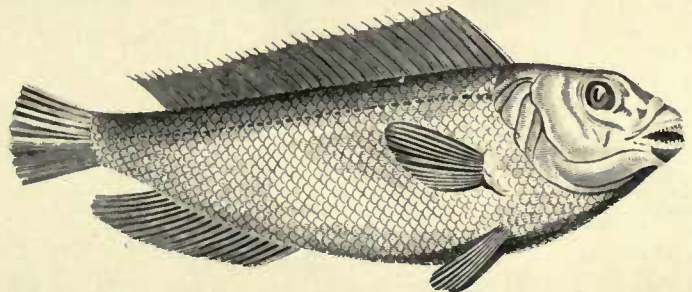
B. Surinamensis - Surinam Toad-fish.



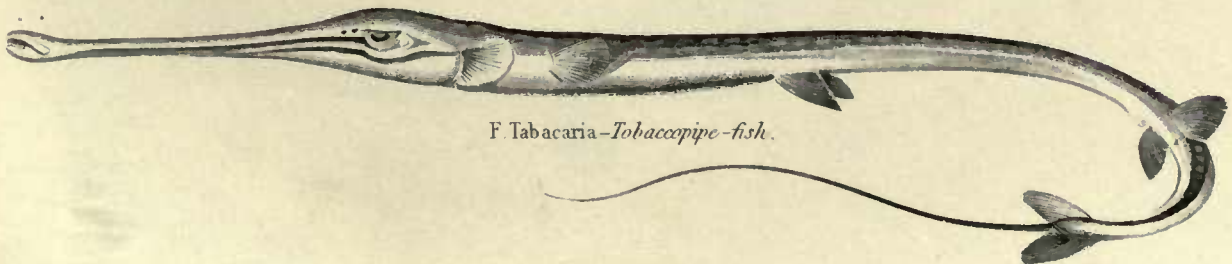
Lab. Carneus - Red Wrasse.



C. Scolopax - Sea Woodcock.



S. Creticus - Gt. Scarus.



F. Tabacaria - Tobacco-pipe-fish.

Order Malacopterygia Abdominales

PISCES.

Family Cyprinoides, Esocides, Siluroides

PLATE 6

Genera Cyprinus, Cobitis, Anableps, Esox, Etheostus, Silurus, Ameiodes, Loricaria



Cyp. Carpio - Carp.



A. Tetraodon - Four-eye.



Cob. Fossilis - Mudpuppy.



Ex. Exilis - Flying-fish.



Es. Lucius - Pike.



L. Cirrhosa.



P. Cyclopum.



S. Glanis - Sheat-fish.

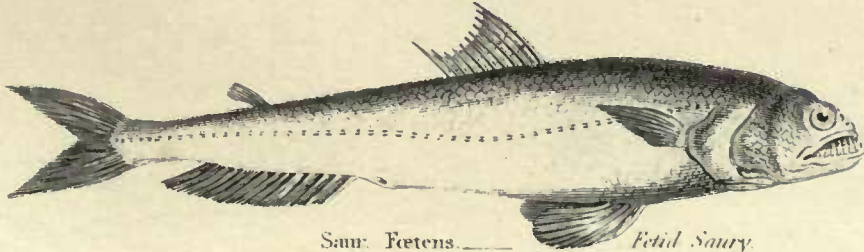
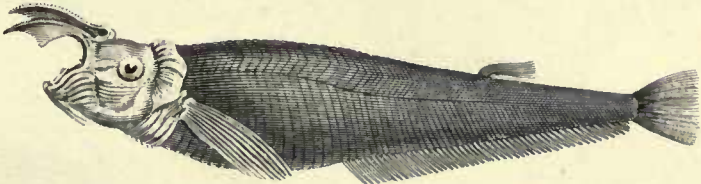
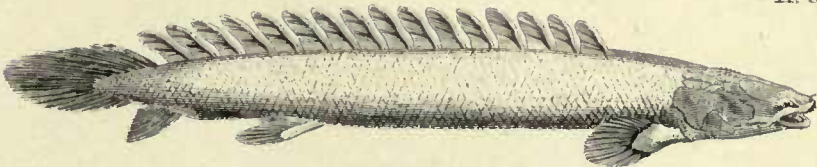
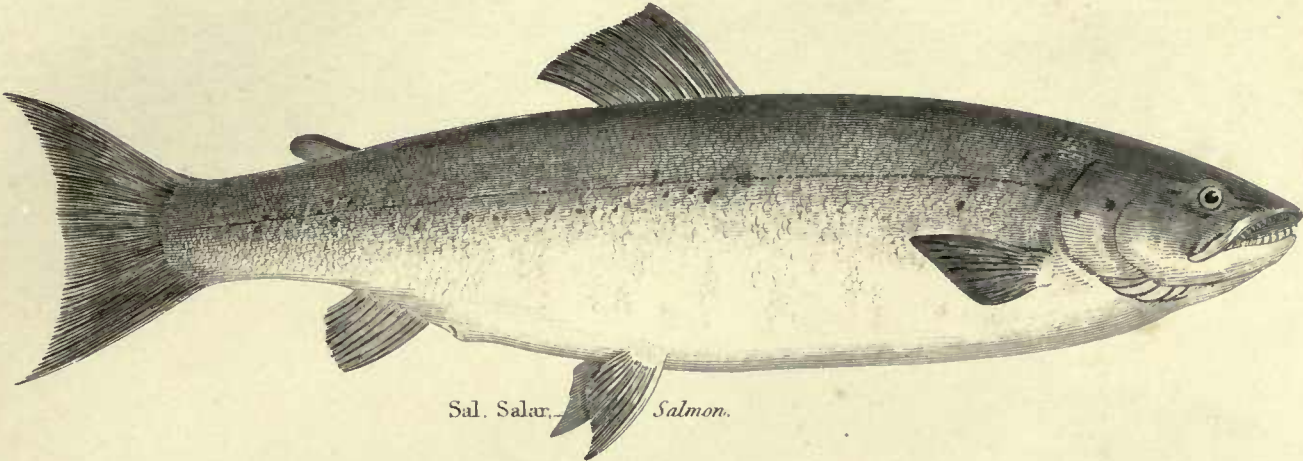
PISCES.

PLATE 7.

Order: Malacopterygii Abdominals.

Genera: Salmo, Arg-utina, Saurus, — Clupea, Gnathobolus, Polypterus.

Family: Salmonides, Clupeoides.



PISCES.

PLATE 8

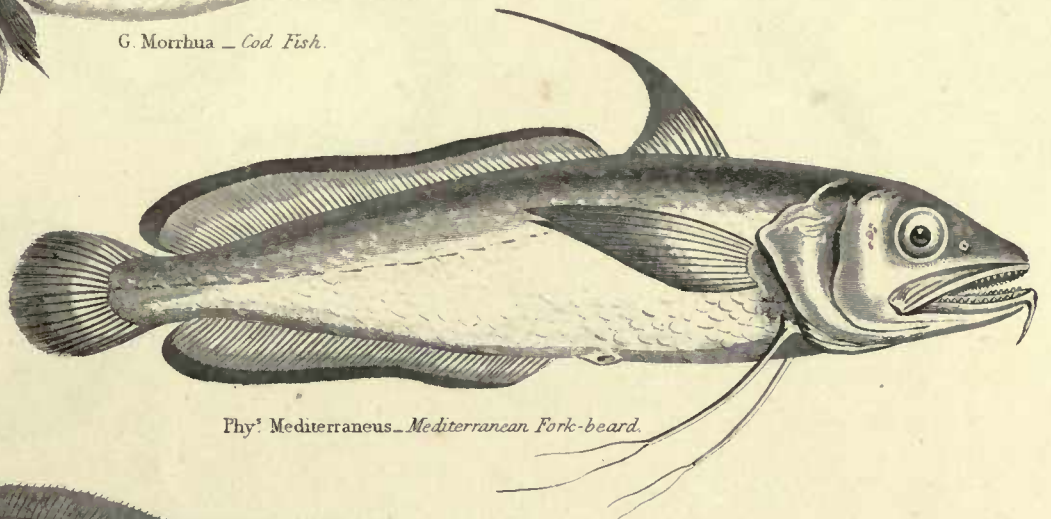
Order. Malacopterygii Subbrachiales.

Family Gadoides, Pleuronectides, Discoboloides.

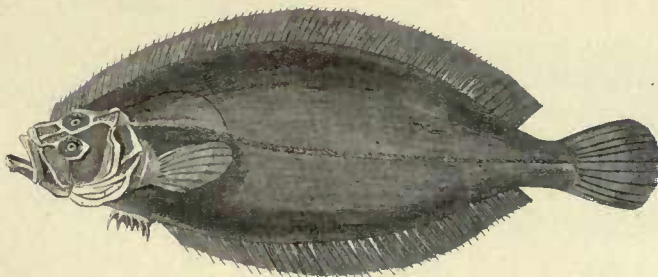
Genera. Gadus, Phycis, Platessa, Rhombus, Solea, Lepidogaster, Echeineis.



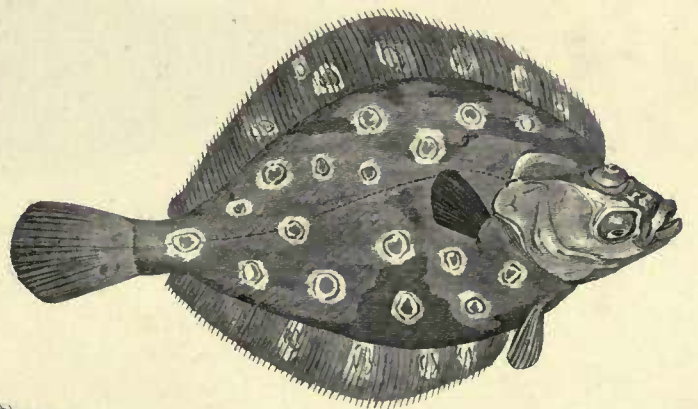
G. Morrhua — Cod Fish.



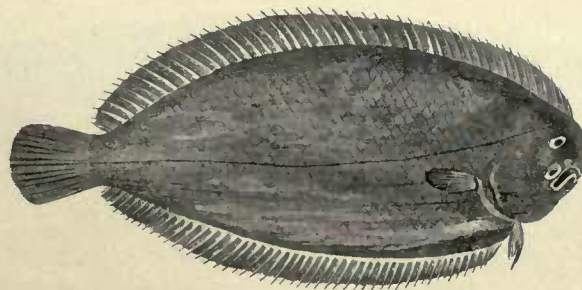
Phy. Mediterraneus — Mediterranean Fork-beard.



R. Megastoma — Whiff.



Plat. Vulgaris — Plaice.



S. Vulgaris — Sole.



L. Cornubiensis — Cornish Sucker.



E. Remora. Common Remora.

Cho. Bone, delin.

J. W. Lowry sculp.

PISCES.

PLATE 9.

Order. Malacopterygii Apodes.

Family. Anguilliformes.

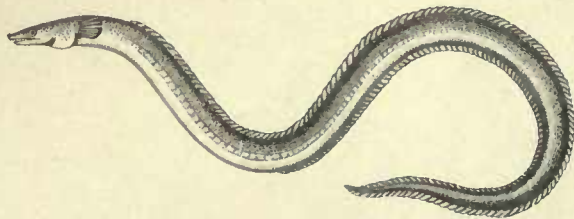
Genera. Anguilla, Conger, Ophisurus, Muræna, Sphagebranchus, Saccopharynx, Gymnonotus, Leptocephalus, Ophidium, Ammodytes.



Ang. Acutirostris — Sharp-nosed Eel.



C. Vulgaris — Conger.



Ophis. Hyala — Glassy Ophisure.



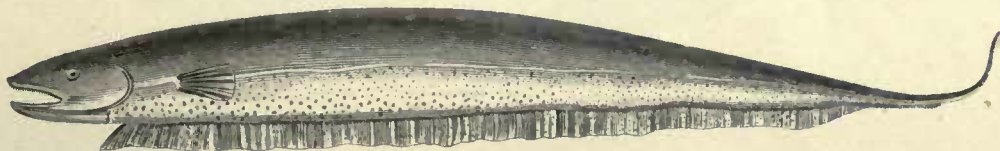
M. Meleagris.



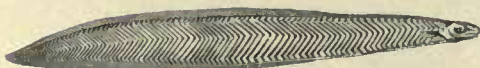
Sphag. Rostratus.



Sacc. Harwoodii.



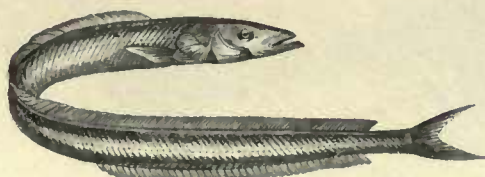
G. Equilabianus — Even-lipped Gymnote.



L. Mornisii — Anglesea Morris.



Ophid. Imberbe — Beardless Ophidium.



Ammod. Lancea — Sand Lance.

M^r Holmes delin.

J. W. Lowry sculp.

PISCES.

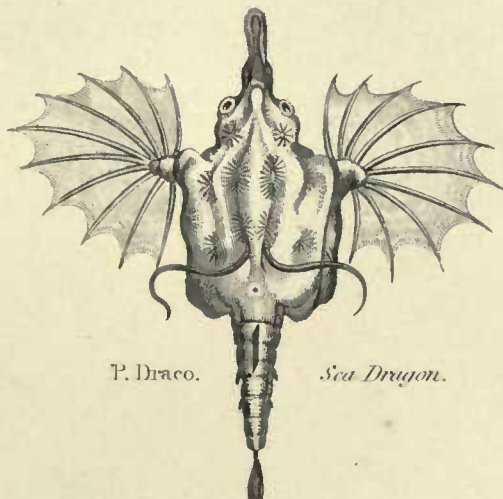
PLATE 10.

Order: Lophobranchiati.

Genera. Syngnathus. Pegasus.



S. Typhle. Needle-fish.



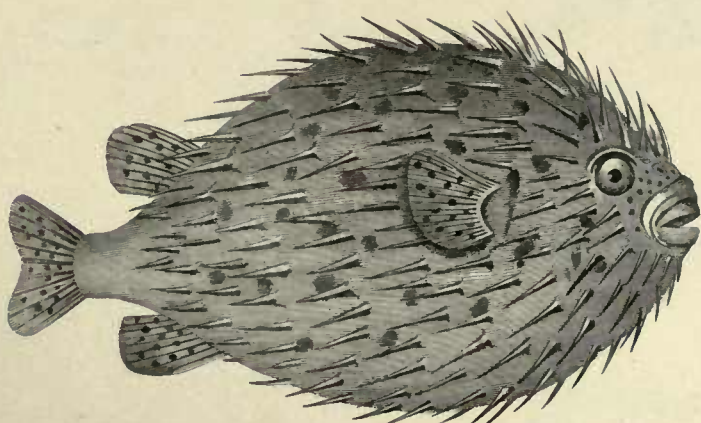
P. Draco.

Sea Dragon.

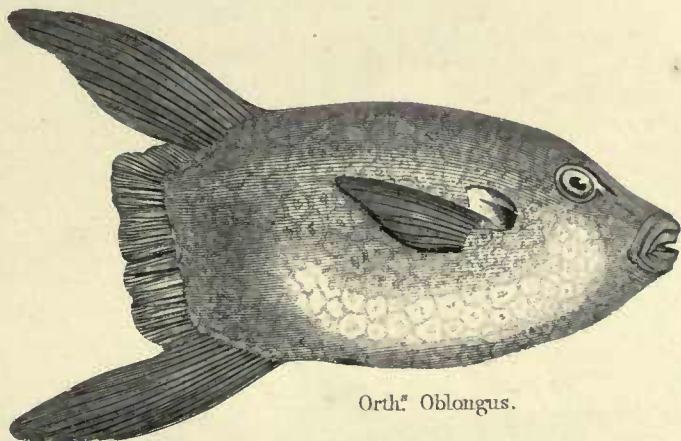
Order: Heterognathi.

Family: Gymnodontes Sclerodermes.

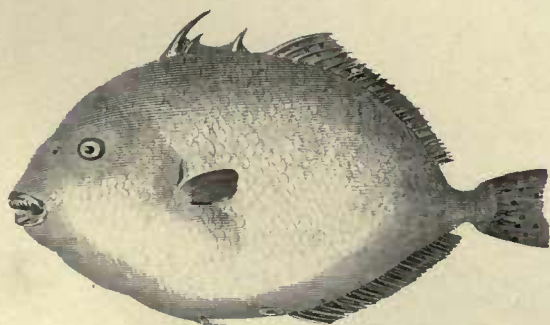
Genera. Diodon, Orthogoriscus, Balistes, Ostracion.



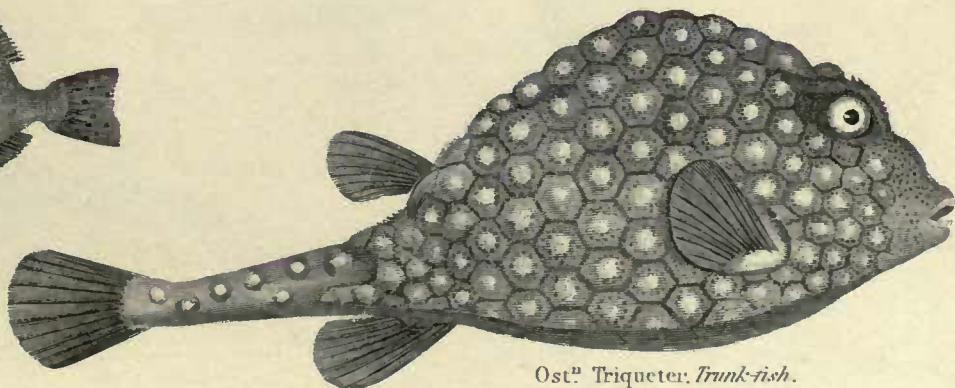
D. Hystrix. Round Diodon.



Orth. Oblongus.



B. Capriseus.
Mediterranean Filefish.



Ost. Triquetra. Trunk-fish.

Chas. Bone delin.

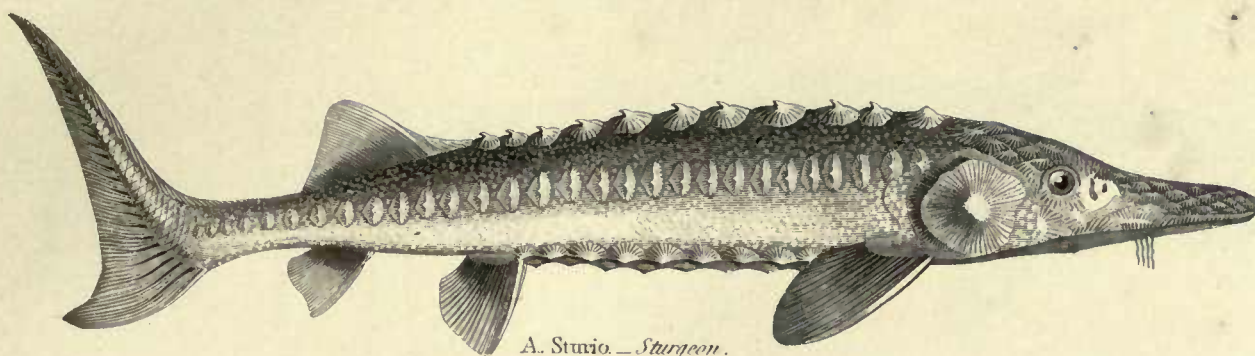
J.W. Lowry sculp.

PISCES.

Order. Chondropterygii branchiis liberis.

Genera. Accipenser, Polyodon, Chimaera.

Family. Sturionides



A. Sturio. — Sturgeon.

Head of Sturgeon.



Under Surface.



Upper Surface.



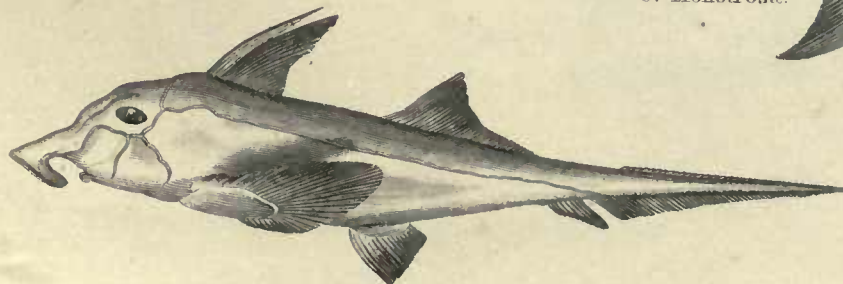
A. Ruthenus. — Sterlet.



P. Folium.



C. Monstrosa.



C. Callorhynca

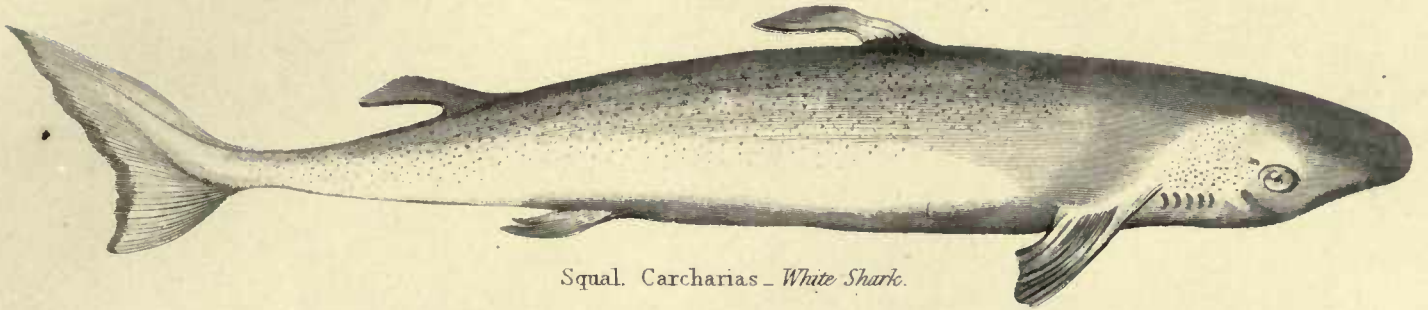
Order. Chondropterygi branchius fixis.

PISCES.

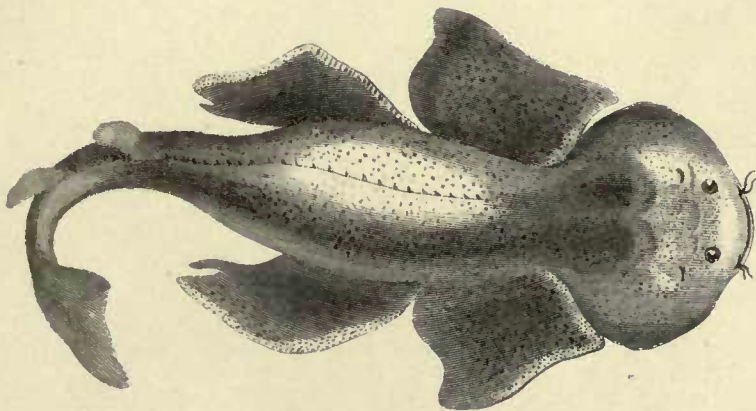
Family. Plagiostomati, Cyclostomati.

PLATE 12.

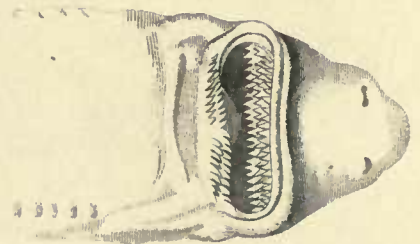
Genera. Squalus, Squatina, Torpedo, Raja, Petromyzon, Gastrobranchus.



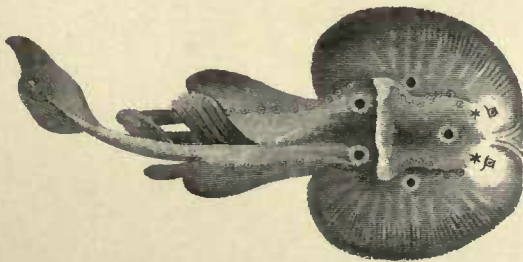
Squal. Carcharias - *White Shark.*



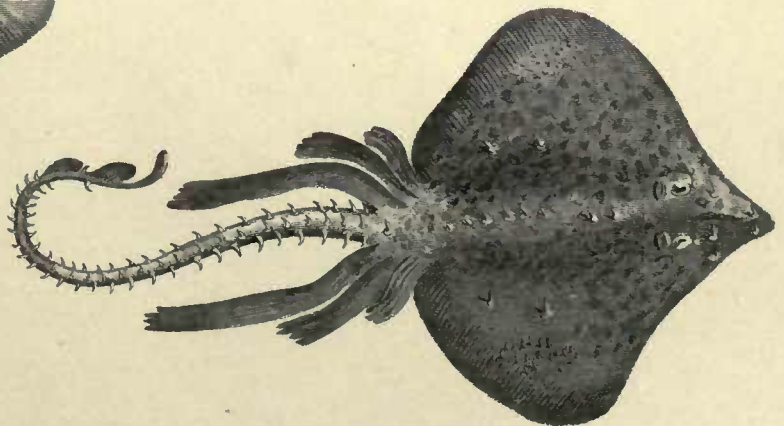
Squat. Angelus - *Angel Fish.*



P. Marinus - *Sea Lamprey.*



T. Narke - *Spotted Torpedo*



R. Clavata - *Rough Ray.*



G. Cæcus - *Myxine.*

SECOND DIVISION.

INVERTEBRATE ANIMALS.

THE Invertebrate series of Animals include the Molluscs, Crustaceans, Insects, Radiated and Infusorial Animals; none of which, varying as they do from each other in several most important particulars, have an internal spinal arrangement.

CLASS V.—MOLLUSCA.

THIS very extensive division of animals are characterised by being invertebral, soft, inarticulated, acephalous, or furnished with a more or less prominent head at their anterior part, most frequently having eyes or tentacula, or crowned at its summit with arms; mantle various; sometimes with its edges free on the sides of the body, and sometimes having its lobes united so as to form a bag, which partly envelopes the body; branchiæ various, rarely symmetrical; circulation double, one particular, the other general or simple; heart unilocular, sometimes with two divided and widely-separated auricles; no gangliar medullary cord, but scattered and not numerous ganglia and various nerves; body sometimes naked externally, and either destitute of solid parts within, or covering a shell or hard bodies, sometimes furnished externally with a sheathing or enveloping shell. These animals have been divided by naturalists into several Classes, Sub-classes, and Subordinate Groups.

MOLLUSCS are distinguished from Insects by the entire absence of any jointed disposition of their external covering, which, on the contrary, is either soft, consisting of an external skin, lined internally with muscular fibres, as in the *Cuttle-fish* and *Slug*, forming a perfect envelope to the whole animal, and, as in the former, furnished with arms or claspers; or the covering is partially of this kind, more specially collected into one particular part of the animal, and forming its foot or locomotive organ, as in the *Snail*, and partially a membranous bag, in which the viscera are contained, and thence called the visceral bag, which is protected from injury by the enclosure of a shell, as in the just-mentioned animal. To this covering of the viscera, membranous as in the *Snail*, and all the Molluscs covered with a shell or shells, or with a leathery envelope like the *Ascidia*, or skinny, with a muscular lining, as in the *Cuttle-fish*, the term *Mantle*, *pallium*, has been generally but loosely applied, for it gives the same name to things very different. Again, the term *Mantle* is equally applied to the membranous-like flaps of skin which turn off from the body of a Mollusc like the *Oyster*, and enclose its sides as the covers include a book, and to the collar by which the visceral bag of the *Snail* is connected with its foot, and still more strangely to the shield-shaped portion of skin which protects the heart and respiratory organ of the *Slug*. It would certainly be better to distinguish these very different parts into, first, the *visceral bag* enclosing the intestines, which, in the *Naked Molluscs*, as the *Cuttle-fish*, *Slug*, and the like, consists of skin and muscle, and in those which are contained within a single or univalve shell, as in the *Snail*, is membranous; secondly, the *collar* which surrounds the junction of the visceral bag with the foot, as in the *Snails*, and all *Univalve Molluscs*; and, thirdly, the *mantle* or leaf-like reflections of the membranous visceral bag, observed in the *Oyster* and all *Bivalve Molluscs* (*i. e.* such as have a pair of shells), and which serve the double purpose of connecting and producing partially, if not entirely, the shells, the interior of which they overspread.

SUB-CLASS—CEPHALOPODA. HEAD-WALKERS.

THIS class is generally held as the highest of the Molluscs, from its presumed approximation to the Vertebrate series, in its possession of some internal cartilaginous masses, of which the principal is considered as a rudimental brain-case or skull for the partial protection of the large nervous ganglions supposed to be analogous, to a certain extent, with the brain of vertebrate animals. The *Cephalopods* are so named from having their limbs or arms disposed around the head, pretty much like the petals of a flower around its stamina. The arms, when expanded, stretch out in a radiated form, and the junction of their roots produces a thick muscular ring or cup, its area overspreads with a loose skin, in the centre of which is placed the

aperture of the mouth, containing a pair of horny jaws, their shape nearly resembling that of a parrot's beak. The head and arms of the *Cephalopod*, in its ordinary crawling motions, rest immediately, and more or less completely, upon the bottom of the sea in which they live, whilst the body or trunk, consisting of the bag which encloses the viscera, rises above them like a tree-stem above its roots: hence they may be justly described as walking upon their head, a fact necessary to be remembered in connection with the detail of their anatomical characters. But this movement is not the only one they are able to perform, for they have also the power of darting themselves through the water, or swimming, though not in the ordinary acceptance of the term; this motion being effected by the sudden expulsion of the water contained in the cavity enclosing the gills, which jerks the animal backwards.

Cephalopods are divisible into two sections, which have been named by Owen, in reference to the number of gills, or *branchiæ*, with which they are furnished; hence those having four gills are called *Tetrabranchiate*, whilst such as have but two are *Dibranchiate*.

The *Tetrabranchiate* section are connected with the *Gasteropods* by the enclosure of their whole visceral bag within the outermost chamber of their shell, and by the strong connection of the animal itself to the shell by means of a pair of powerful muscles, arising from the cartilage which Owen calls the body of the skeleton. Of this section the *Pearly Nautilus* is an example.

The *Dibranchiate* section. All the *Naked Cuttle-fish* are examples of this section.

ORDER—OCTOPODA (LEACH). HAVING EIGHT FEET.

ILLUSTRATIVE EXAMPLES.

PLATE 1.

ARGONAUTA. Shell univalve, very thin, involute; the last turn very large. A double tuberculated dorsal carina.

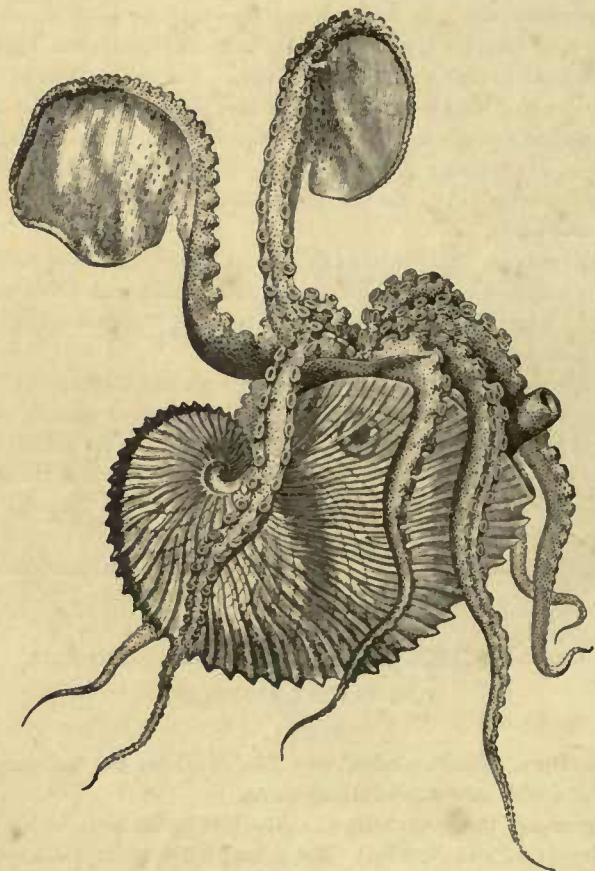
The species of this genus were all confounded by Linnæus, in his *Argonauta Argo* (the *Paper Nautilus*). The animal, which inhabits this beautiful shell, is so nearly allied to the genus *Octopus*, or eight-armed *Cuttle*, as to afford but few marks of distinction. (See *OCTOPUS*.) Two of the arms of the *Argonauta* are furnished with a large expanded membrane, by means of which the calcareous secretion is poured out for the enlargement or reparation of the shell. The opinion that these membranes, when expanded, served the office of sails, enabling the animal to glide upon the surface of the water in calm weather, is now exploded. The shell is of a thin papyraceous appearance, white and semi-transparent. Its form is particularly elegant, resembling a kind of boat or vessel, and is marked throughout its surface by numerous deep furrows. Few objects can be conceived more

interesting than the poetical description given of this beautiful animal seated in its pearly little vessel, its sails spread, and the remaining six tentacula serving for its oars. On the slightest appearance of danger, it withdraws itself into its shell, and is instantly submerged.

Illustrations: *Argonauta varicosta*, A. Argo. Exemplified in the Paper Nautilus and Ocythoe Cranchii.

The *Paper Nautilus*, or *Paper Sailor* (Plate 1, fig. 3-8), has from a remote period—from before the days of Aristotle to the present time—been an object of much interest to zoologists. It has been regarded as the first instructor of man (by its own example) in the art of navigation; and many romantic and fabulous stories of its wonderful sailor-like skill have come down to us from ancient times. A difference of opinion respecting the shell occupied by this cephalopod, has also added to its interest as an object of zoological inquiry—some naturalists maintaining (among whom is Dr. Owen) that the animal is itself the original fabricator of its shell, while others (Dr. Leach, De Blainville, &c.) have asserted an opposite opinion, viz., that the cephalopod is either a mere parasite—as the Cancer Barnardus, and other parasitical Crabs—or that it is nothing short of being a piratical intruder, who, having dispossessed the proper owner, became the lawless occupant of his dwelling. The former opinion is, however, now generally admitted as correct; for the experiments of Madame Power, and the anatomical researches of Dr. Owen, have placed the matter almost beyond dispute.

The characteristics of the *Paper Nautilus* are—body oblong and rounded; mantle adhering to the head posteriorly; dorsal or first pair of arms



Paper Nautilus.

membranous and dilatable at the extremities; funnel destitute of a valve, but articulated at its base to the inner sides of the mantle by two ball-and-socket joints; heart branchial, with fleshy appendages; no horny or testaceous internal rudiments; body contained in an external, monothalms, and symmetrical shell, but not attached to it; the animal deposits its eggs in the spiral cavity of the shell. The molluscous animal inhabiting the beautiful and fragile bark already described is named *Ocythoe*, one species of which is shown on Plate 1 (figs. 1, 2).

The *Ocythoe Cranchia* is, according to Leach, of the family *Decapoda*, having tentacular appendages, ten in number; it is found in Owen's *Teuthida*. The animal is characterised by an elongated, sacciform body; natatory appendages, or fins, ten in number, circular and of small size, pedunculated and nearly touching each other at their origin at the back; dorsal piece altogether wanting (Plate 1, figs. 1, 2).

The Cephalopod is furnished with three stomachs—an œsophagus, a gizzard nearly as fleshy as that of birds, and a spiral and membranous cavity in which the liver discharges its bile. The respiratory current passes through a fleshy pipe or funnel situated in front of the neck and communicating with the *branchiæ*. These organs are protected by the mantle under which they are concealed. In the higher-organized Cephalopods three distinct hearts are found, while in those of the lowest organization only one heart is discoverable. The eye, which is covered by a transparent portion of the skin, is composed of numerous membranes; the ear is a simple opening, in which a membranous sac is suspended containing a limpid fluid, and a small stony substance or otolith. The skin of the naked species is changeable like the skin of the Chameleon. Some of the Cephalopods are furnished with a bag containing an inky secretion, which they carefully reserve till an occasion arises necessary for its effusion, thus blackening the surrounding water, under cover of which they generally effect their escape.

Four of the principal genera are as follow:—

LOLIGO. Body long, with two angular fins on the hinder part of the back, on each side of the tail; the support cartilaginous, pen-shaped. This genus was separated from the *Sepia*, or Cuttlefish of Linnæus, by Lamarck; they are usually called *Sea-sleeves*, and their bone a *Sea-pen*.

The type of the genus is *L. Media*, the *Sepia loligo* of Linnæus, common on the English coast.

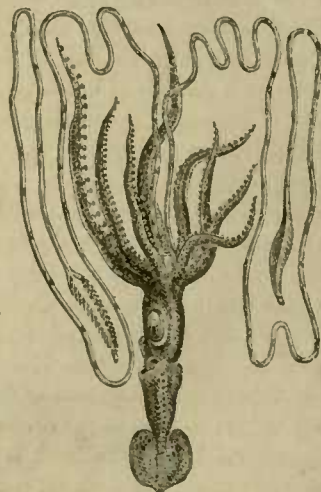
One species, *Loligopsis*, is remarkable for the extreme length and gracility of its two arms.

NAUTILUS. Shell discoid, spiral, multilocular, with simple sides, the latter equal; whorls contiguous, the last embracing and concealing the previously-formed ones; *septa* transverse.

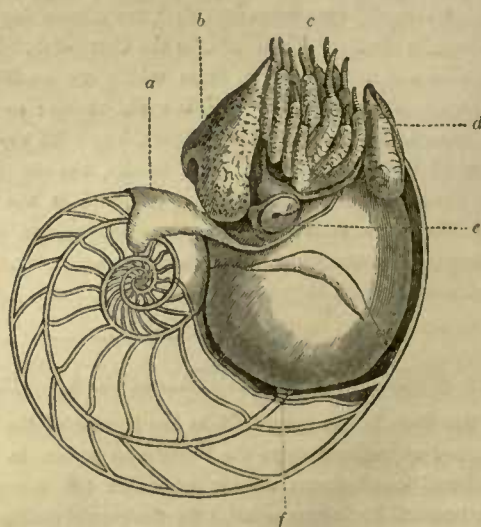
Type of the genus, *N. pompilius*. This is an extensive genus, consisting of recent and extinct species; the former marine, and several of both found on the coasts and crags of Britain.

OCTOPUS. Body fleshy, obtuse beneath, and contained in a sac, which has no wing-like appendages, nor internal dorsal bone, or a very minute one only; head distinct, furnished with a terminal mouth, armed with two horny mandibles, and surrounded with eight simple, elongated arms, furnished with sessile suckers.

Type of the genus, the *Sepia octopus*, of Sowerby, the *O. vulgaris* of Fleming. Several species, three of which are found on the British coasts.



Loligopsis.



a, portion of mantle; b, foot; c, tentacula; d, funnel; e, eye; f, siphon.

Pearly Nautilus; shell laid open.

SEPIA, or *Cuttle-fish*. Head surrounded with eight arms and two legs or feelers; body fleshy, depressed, contained in a bag, which is obtuse behind, and furnished with a narrow fin on each side throughout its whole length; mouth terminal, its mandibles resembling those of a parrot, very large and powerful; arms furnished with sessile suckers, legs with pedunculated ones; within, near the back, is a spongy, calcareous, opaque bone, varying slightly in form in the different species; and in the abdomen is a bag which contains an inky fluid.

The type of the genus, *S. officinalis*, is abundant in the Atlantic and Mediterranean Seas; found, but somewhat rarely, in the British and Irish Channels; the dorsal plate is known by the name of Cuttle-fish bone, and was formerly employed in medicine as an absorbent; the inky fluid of some of the species had been erroneously supposed to be the pigment employed by the Chinese in the composition of Indian Ink.

The **AMMONITES**, or *Snake stones*, are found in a fossil state. Septa angulated; margins undulated, or marked like the leaves of an *Acanthus*. They are found in beds of the secondary mountains, varying in size from that of a pea to an ordinary-sized cart-wheel. They are subdivided according to the variations of their whorls and siphon.

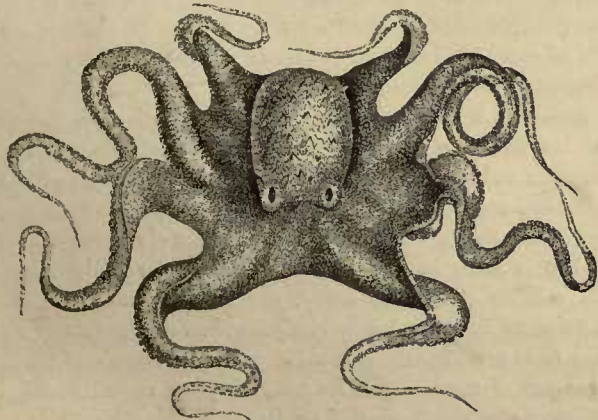


Ammonites.

Of this section (*Tetrabranchiate*), the *Pearly Nautilus* is an example. (Engraving on p. 128.)

In the *Pearly Nautilus* the mantle, so called by Owen, is attached to the hind part of the head, before passing back to cover the viscera and form the visceral bag, is produced into a large fold, concave posteriorly, overlapping the involuted convexity of the shell, and sending down on each side a lengthy process, free and unattached, which he considers capable of being expanded over the anterior margins of the shell's mouth. Close to the basal angles of this mantle are the eyes, not sunken, but supported on short pedicles, and thus indicating the position of the head cartilage, their ganglions resting upon its dorsal extremities.

The skeleton of the *Octopus*, the largest animal of the *Dibranchiate* section, is least developed: the head cartilage is of an irregular form, its



Octopus or Poulp.

middle pierced by the aperture for the gullet; its hind part contains the so-called brain, and its membranous externally; and laterally it supports a pair of large ganglions; in front it is thicker and harder, encloses the remainder of the œsophageal nervous ring and the organs of hearing, and on either side stretches out a plate, which gradually thins and supports the eyes. From the under surface of the cartilage arise eight long muscular arms of a trihedral form, and gradually tapering towards their tip; upon the base of which are two rows of circular suckers, of various size, and about two hundred and forty to each arm. No contraction indicates the neck, but the visceral bag rises above the head, is large and muscular, and contains a pair of slender styliform cartilages, corresponding to the horny belts of the *Pearly Nautilus*. In front of the visceral bag and near the head is the aperture of the funnel, which is a perfect tube. The general

form of both kinds is lengthy, with a narrowed neck, distinctly separating the head from the visceral bag, which is flattened from before to behind, and the connection between which is so long that the head and neck can be retracted and projected from the bag to a considerable extent.

In the *Calamaries* (*LOLIGO*) and *Cuttle-fish* (*SEPIA*), the so-called skeleton acquires a more well-defined form, in connection with the horny pen-shaped organ existing in the hind part of the visceral bag of the former, and the calcareous plate occupying the same portion in the latter. The form of the head cartilage in the *Arrow calamary*, *Loligo sagittata*, and in the *Common Cuttle-fish*, *Sepia officinalis*, is very similar, but in the



Calamary.

former is deeper from behind forwards, and in the latter widest from side to side; in the *Cuttle* also it is thickest. In shape it resembles a slouched hat without the head, its concavity towards the mouth, and its convexity facing the visceral bag. The number of the arms in both *Calamary* and *Cuttle* are four pairs, short in the former, and nearly as long as the body in the latter, their basal surface furnished with a double row of suckers. But besides these, each kind is furnished with a pair of very long arms, of a flattened cylindrical form, and expanding at their tip, each into a lozenge-shaped surface, upon which part only suckers exist. The real use of these long arms is probably to fix the animal, like anchors, to a particular spot, whilst the short arms are employed only in applying the food to the horny, parrot-like mandibles, which project through the aperture of the circular lip.

The visceral bag in the *Calamaries* and *Cuttle-fish* is of a lengthy form, flattened from behind to before, but more cylindrical in the former; in front it principally consists of a thick muscular structure, but on its posterior surface this is either deficient or very thinly overspreading a shining coat, which lines the whole of its interior cavity: this part of the animal, however, is protected by the existence in the *Calamary* of a horny body, which, from its resemblance, is called the *pen*, and, in the *Cuttle-fish*, of a calcareous structure, called its *bone*, which was supposed by Spix to be the analogue of the spine of Vertebrate animals; an opinion long since exploded. Upon the fore part of the neck of the *Calamary* and *Cuttle-fish* is situated the funnel already referred to, in shape like a flattened conical tube deprived of its tip, which forms its orifice just above the root of the anterior arms. Its base is received within the front of the wide mouth of the visceral bag, slightly connected to it by the thin external skin, and by the lining membrane; but more firmly by a pair of cartilaginous ear-like sockets on the front of the base of the funnel, which receive into their cavities a pair of oblong cartilaginous studs, projecting from the corresponding surface of the visceral bag. Both are more distinct in the *Cuttle-fish* than in the *Calamar*, as might be expected from the great extent of the aperture of the visceral bag in the former than in the latter, and therefore requiring a stronger connection.

ORDER—FORAMINIFERA (D'ORBIGNY). FULL OF HOLES.

THIS Order, which was established by M. D'Orbigny, consists of innumerable minute, foraminated, polythalamous, internal shells, the greater number of which are microscopic. The name given by D'Orbigny to this Order was suggested to him by the circumstance that the cells communicate only by small holes (foramina). These shells exist in myriads on the sea-coasts; they are also found in the chalk or tertiary formations in countless multitudes. In De Blainville's arrangement the families of this order are included among his *Cellulacia*; but in Owen's both classifications are abandoned; for that eminent naturalist having made the respiratory system the foundation of his arrangement, was led to reject the *Foraminifera* from the Molluscos series, because of their deficiency of any trace of Cephalopodous organization, as well as from the very low position they occupied (when living) in the scale of creation. Hence, in Plate 2, we have indicated their doubtful position by a significant sign (?).

ILLUSTRATIVE EXAMPLES.

PLATE 2.

NODOSARIA. Shell elongated, straight, or a little bent, subconical, nodose, with bulgings at the place of the cells; transverse septa perforated.

Type of the genus, *N. radícula*. Inhabits the Adriatic Sea.

Illustrations: *Nodosaria levigata*, *Marginulina raphanus*, *Pavonia flabelliformis*.

TEXTULARIA. The genus *Textularia* consists of Microscopic Foraminifera, having numerous alternate chambers with marginal aperture. The wall of each turn is complicated, extended, and united on each side to the other discs.

Illustrations: *Polymorphina communis*, *Textularia aciculata*.

ROTALIA. Shell orbicular, spiral, convex, or conical above; flat, radiated, and tubercular beneath, many-celled; aperture marginal, triangular, resupinate.

Type of the genus, *Nautilus Beccaria*. Several species (minute) are found on the coasts of Britain; others of a larger size occur in a fossil state.

Illustrations: *Uvigerria pygmaea*, *Bulimina marginata*, *Rosalina globularis*, *Truncatulina refulgens*.

POLYSTOMELLA. Shell disciform, multilocular, with contiguous turns not visible externally, and marked with furrows traversing the whorls; aperture composed of several holes variously disposed.

Found only in a fossil state.

Illustrations: *Plamulina araminensis*, *Dendritina arbuscula*, *Nonionina umbilicata*.

MILIOLA. Shell ovate-globose or elongated, transverse, multilocular, with transverse cells surrounding the pillar and alternately covering each other; aperture very small, situated at the base of the last whorl; orbicular, or oblong.

Chiefly fossil; minute, occurring abundantly in the works of certain quarries near Paris, and in a recent state on fuci, near Corsica.

Illustrations: *Biloculina bullioides*, *Triloculina trigonula*, *Qumqueloculina saxorum*.

ORBICULINA. Shell subdiscoid, multilocular, with compound, contiguous turns; spire eccentric; cells short, very numerous; septa imperforate.

A fossil genus, containing several species, none of which are British.

Illustrations: *Amphegistina Qyoi*, *Heterogystina depressa*, *Tabularia discolithes*.

SUB-CLASS—GASTEROPODA. BELLY-WALKERS.

THE whole of Cuvier's Cyclobranchiate, Scutibranchiate, Tubulibranchiate, and Pectinibranchiate Gasteropods, and also both the Aquatic and Terrestrial Pulmonibranchiate Gasteropods, excepting the single genus *Vaginulus*, are furnished with a single or univalve shell, placed upon the dorsal surface of the body, and varying remarkably in its position and size: thus in *Parmacella* it is shallow and small, and on the middle of the back; in *Testacella* (Plate 3) also small, and on the hind part of the back; and in *Limax* (Plate 3) on the fore part of the back, but remarkable in this genus as being concealed by the skin: in all three genera it forms a vault over the pulmonary cavity. Other and larger shells, as the *Sea Ear*, *Halotis*, cover almost entirely the whole dorsal surface of the animal. But in a very large proportion of the Gasteropods, the organs of nutrition and reproduction are always contained within a capacious conical or tubular shell, and even the head and entire foot can often be retracted within it, as in the *Snail*.

The soft exterior covering of Gasteropods is divided into two distinct parts, the foot and the visceral bag.

The *Foot* consists of a soft expanded tegument, containing within it a large mass of longitudinal muscles passing from one end to the other, and occupying its ventral surface. Its upper surface, when expanded in crawling, forms a longitudinal hollow, which is perfected into a tube by a skinny arch also, and which sometimes overlaps the foot like a fringe. This is generally but too loosely called the *mantle*, from its supposed correspondence to the mantle lining Bivalve Shells; and sometimes designates all the upper

or dorsal surface of the animal which can be protruded from the mouth of the shell, but at other times is restricted to the shield-like piece which covers the lung of the Pulmoniferous Gasteropods, and either, as in the *Slug*, includes the shell, or, as in *Parmacella* and *Testacella*, has the little shell resting upon it. From its fore part the head protrudes, and seems, as in the *Snail*, to consist merely of processes of this dorsal tegument. In *Vaginulus*, *Testacella*, *Parmacella*, and *Limax*, the dorsal tegument is perfect; but in most other Gasteropods it is deficient either far forwards, as in the *Trachelipods*, or farther back, as in the *Limpets*. Around this aperture is attached the *Visceral bag*, membranous and varying in form, conical or convoluted, as in the *Limpet* and *Snail*, but distinctly corresponding with the muscular visceral bag of the Cephalopods. Around the junction of the visceral bag with the dorsal surface of the foot, a loose sort of membranous girdle, enclosing the apparatus for secreting the shell, is placed; this is the collar, and analogous to the mantle of Bivalve Shells.

The primary form of all Univalve Shells is resolvable into that of a simple hollow cone, of which the top is the *tip* or first-formed part of the shell, and the *base* the last formed, which continually grows and forms the open area of the cavity of the shell, the walls of which, included between the base and the tip, are called the *body* of the shell; these circumstances are well exemplified in our *Common Limpet*, *Patella Vulgata*. But from this simple condition the cone gradually varies in different kinds of shells, both in the comparative dimensions of its parts and in the direction which its base, or recently-formed part, takes, whence arise the diversified forms of shells. The technical name of the convolutions of shells is *whorls*, *anfractus*. In most instances shells, instead of revolving in the same plane, and acquiring a disc-like form (hence called *Discoid*), grow obliquely forwards, from right to left, so that the tip of the shell, whence the growth had commenced, is generally to the right and above, and the aperture to the left and below; sometimes, however, the growth is from left to right, and hence the terms *right* and *left*, or *dextral* and *sinistral* Shells. All such Shells are said to form *spires*, which consist of all the whorls between the tip and the aperture of the shell; and in proportion as the whorls are flatter, wider, and shorter, as in the *Helix Algira* (Plate 3), or rounder, narrower, and longer, as in the *Scalaria*, the shell is said to be *turbinated* or *spiral*. Sometimes, as in the semirevolute Shells, the whorls are perfectly distinct from each other, of which the *False Wentletrap*, *Scalaria communis*, furnishes an example; but more commonly they rest against each other, as in the *Snails*.

The transition, in all its varieties, of different Shells from one form to another, the difference of shape in the Shells themselves, and of their different parts, and the peculiar forms assumed by the margin of the apertures of Shells, and the direction which they take, are too numerous to be considered here, although they form very important characters of the several kinds. But it must be observed, that the interior of Univalve Shells generally consists of a single cavity, and such are called *Unilocular* or *Monothalamous*. In some, comparatively few, however, the cavity is divided by less or more perfect partitions; such are called *Chambered* Shells; and if the number of the chambers be many, they are named *Multilocular* or *Polythalamous*, of which the shell of the *Pearly Nautilus*, *Nautilus Pompilius*, a Cephalopod, affords a good example. The connection of an Univalve Shell to the animal which it partially or wholly contains, is by its collar just within the aperture; but in addition to this, muscular fibres also pass from it to the foot, and, as in the *Snail*, from the lowest or basal extremity of the columella.

ORDER—PULMONIFERA. AIR-BREATHERS.

THE arrangement of the Gasteropods rests almost entirely upon the conditions of their respiratory organ: the greater number, being aquatic, are furnished with gills, *branchiae*, whilst the remainder have lungs, *pulmones*, and either live entirely on the earth's surface, or, living in water, are compelled to rise to its surface, in order to inspire fresh air. Hence the Gasteropods are divided into Branchiferous and Pulmoniferous; the *Com-*

mon Whelk, *Buccinum undatum*, is an example of the former, and the Garden Snail, *Helix hortensis*, of the latter.

ILLUSTRATIVE EXAMPLES.

PLATE 3.

LIMAX. Body long, contractile; above convex, beneath flat, with a long foot the whole length of the body; *tentacula* four, unequal, the two upper long, with the eyes at the end.

This genus of naked, land, molluscous animals, was established by Linnæus, but restricted by Lamarck. They differ from the other mollusca Snails by breathing free air in a pulmonary cavity lined with minute, pulmonary vessels. They are usually called Slugs; they differ from the Snail in having no shell. They have been divided into two genera, one being provided with a small shelly plate in the shield (*arion*, Plate 3), while others have only a few crustaceous grains in that part.

L. maximus vel *antiquarius* (Plate 3) is the type of the genus. It is common in cellars and damp places in England.

Illustrations: *Arion antiquorum*, *Limax variegatus*.

TESTACELLA. Body lengthy, slug-like, with the foot not very distinct, and furnished posteriorly with a very small, external, very flat, ear-shaped shell, slightly spiral at its apex, and having a very large oval aperture, the left edge of which is sharp and a little inclined inwards; its four tentacles intractile, and the posterior larger pair supporting eyes on their tips; pulmonary aperture round, and on the right side near the top of the shell, near to it the vent; generative aperture beneath the right large tentacle.

This genus has in its form and size much resemblance to a small slug, but is distinguished from it by the cloak, which is very extensible, being placed far back on the body, and containing a very small shell, and by two grooves which pass from the base of the tentacles to the shell; its branchial and anal apertures are also near the tail, instead of, as in the Slugs, being near the fore part. They live constantly under ground, sometimes at a depth of three feet, and are rapacious, feeding upon worms, which they absorb head foremost and gradually draw in as digestion proceeds. Though this mollusk was discovered by Dugue at Dieppe in 1740, yet it is to M. Mauge, who brought home specimens from Teneriffe some years since, the honour is due of having drawn the attention of naturalists generally to this genus. There are three species (Roissy speaks of four), viz., *T. Halio-tideus*, *T. Scutulum*, and *T. Maugei*.

Illustration: *Testacella Maugei*. The shell which covers the posterior part of the pulmonary cavity is external, solid, auriform, with a large and oval aperture: native of Teneriffe, naturalized at Bristol. This, it is supposed, is the only carnivorous terrestrial mollusc.

HELIX. Shell globular or conical; spire short, conical; whorls rapidly enlarging; last generally keeled when young, and sometimes so when full grown; the mouth semilunar, the edge of the mouth reflexed and thickened internally; axis perforated, often covered when full grown.

The species of this genus are very numerous; and every traveller who takes the trouble to save the kinds which fall in his way, is almost sure of adding to their number.

Several experiments have been made on the property which snails possess of reproducing a part which may have been amputated. Spallanzani was the first to observe, that when the head was cut off, it was, after a short time, reproduced. Adanson, in a most positive manner, denied this fact, after trying the experiment on fifteen hundred individuals; but he admitted that the wound would heal if the head was left attached by a portion of the skin.

Like most terrestrial shells, only a few species have been found fossil. Brongniart has described seven species, found in the neighbourhood of Paris.

Illustrations: *Helix naticordes*, *H. japonica*, *H. algira*, *H. carocolla*, *H. nux denticulata*, *H. albella*, *H. epistyllum*.

BULIMUS (or **BULINAS**). Shell oval, oblong, or turreted; aperture entire, longitudinal; margins very unequal, disunited above; columella straight, smooth, entire, and simple at the base.

The animals of this genus are all inhabitants of the land, and vegetable feeders. The species consist of many of the land *Testacea*, which Linnæus placed in the genera *Bulla* and *Helix*. The animal has four tentacula, the two larger of which, as in the *Helices*, bear the eyes on their summits. It has no operculum. Its habits are similar to those of the *Helices*. Some of the shells of this genus are amongst the most beautiful and the largest of the land division.

Illustration: *Bulimus ovatus*; not less than four inches and a half in length. There are several small species, natives of Great Britain; as *B. acutus*, *montanus*, *obscurus*, *lubricus*, &c.

PUPA. Shell cylindrical, ribbed, blunt; spire long, obtuse, composed of whorls which gradually increase; mouth sinuous, aperture rounded anteriorly; peristoma reflected. The genus Pupa is composed of land shells with plaited columella; they are of variable form, and differ from the species of *Bulina* in their spiral whorls, and in the plicæ on the columella. They differ from *Clausilia* (next genus) in the want of a clausium. They are found in Britain, South of Europe, Mexico, West Indies, and in other places.

CLAUSILIA. Shell fusiform, slender; slightly obtuse at the apex; aperture irregular, ovate; peristoma complete, free, reflexed.

The most curious circumstance belonging to these little animals, and which distinguishes them from those of every other genus, is the existence, in the adult, of a small shelly plate, serving as an operculum to the shell, but fixed to the shell itself, and having no attachment whatever to the animal; it is found in the neck as it were of the shell, fixed in a groove in the columella by a little elastic thread-like process; when the animal protrudes itself from the shell, it pushes aside this little plate, which, on the animal's retiring, closes the aperture by its own elasticity. They are found amongst moss, dead leaves, and on the bark of trees. There are not less than four or five British species.

Illustration: *Clausilia*.

ACHATINA. Shell elongate, thin, white, turreted; aperture moderate, pyriform, or ovate; outer lip thin, sharp, without any internal rib; columella smooth, tortuous; also so truncated in front as to form a notch at its union with the outer lip.

The notch occasioned by the abruptly-truncated termination of the inner lip, or pillar of the shell, is that by which we are enabled to distinguish the species of this genus from those of *Bulina*, to which, in their general characters, they are allied.

These land shells are pretty generally diffused, but the largest and most beautiful are found in tropical climates.

Illustration: *Achatina Virginea*.

PHYSA. Shell convoluted, oblong, with a prominent spire; aperture longitudinal; peristome wanting in the body whorl; pillar twisted; margin of the mantle loose, divided into lobes, and capable of being reflected over the surface of the shell, near the mouth; operculum wanting.

Type of the genus, *Bulla fontinalis*, Linnæus; Lister. Three species, found in lakes and slow-running streams; one of them not uncommon in England.

Illustration: *Physa rivalis*.

ORDER—GYMNOBRANCHIATA vel NUDIBRANCHIATA.
NAKED-GILLS.

SOME of the Gasteropods are entirely naked, such as the *Doris*, which swims with its foot upwards, and is moved by the fringed overlapping edge of its dorsal tegument, and by a pair of club-shaped tentacles on the back, which serve as a pair of oars; its branchial apparatus is situated around the aperture of the vent, also on the back, and, being free, presents an example of the *Dorso-nudibranchiate* Order; whilst, on the contrary, the naked branchial fringes which depend between the foot and overlapping dorsal tegument of *Phyllidia* indicate the *Infero*, or *Ventronudibranchiate* Order.

ILLUSTRATIVE EXAMPLES.

PLATE 4.

DORIS. Body creeping, rarely floating, oblong, flat, convex, or subprismatical; surrounded by a membrane from the head to the tail; mouth anterior and inferior, trunk-shaped; tentaculæ four, two anterior, placed on the front of the body, retractile into a kind of calix or sheath; anus on the hinder part of the back, surrounded by the prominent gills; gills lobed or fringed; aperture of the organs of generation placed on the right side.

Cuvier, in the fourth volume of the "Annals of the Museum of Natural History of Paris," has given a very extended account of the anatomy of this genus, illustrated with several plates; he has divided the genus into three sections, according to the shape of the body:—

1. Body compressed, much larger than the foot. 2. Body subhemispherical, bordering the foot. 3. Body subprismatical, the mantle edging the foot.

Illustrations: *Doris trilobata*, *D. lacinata*, *D. nodosa*, *D. pennigera*, *D. limbata*, *D. tuberculata*, *D. cornuta*, *D. atromarginata*.

ONCHIDORUS. Differs but slightly from the *Doris*. Body oval and tumefied above; foot thick, oval; tentacular appendages four; labial appendages; mouth covered with a veil.

This genus was established by Blainville, having separated it from the *Doris* of Linnæus and Gmelin.

Illustration: *Onchidorus Leachii*. The foot of this species is overlapped by the borders of the mantle, also the head when contracted; its organs of respiration consist of minute ramifications circularly arranged, and deposited in a cavity at the posterior and mesial part of the back. The figure numbered 9 is a side view; No. 10, the under surface.

PERONIA. The body of this genus, like that of *Onchidris*, is tumefied above, and oval or suboval in form; the borders of the mantle overlap the foot throughout its circumference; tentacula two, and inferior; labial appendages two.

Illustration: *Peronia Mauritanica*. The figure represents the animal from below. The respiratory organ is situated in a cavity at the posterior region of the back, and its external opening is by a rounded mesial orifice, pierced at the inferior and posterior parts of the borders of the mantle.

POLYCERA. Branchiæ not expanded during repose, being covered by two scales; oval tentacula exceeding two in number; body shell-less.

Type of the genus, *Doris flava* (Montagu). One species, a native of the western coasts of Britain.

Illustration: *Polycera quadricornis*.

TRITONIA. Mouth terminal, and encircled with tentacles; body oblong, creeping, pointed behind, convex above, with the gills arranged along the whole length of the back in form of scales, tubercles, or vascular tufts; under surface flat or grooved.

The form of this genus is paralleliped, with the upper surface slightly bagging throughout its whole length, the anterior extremity rounded, and the posterior pointed. The back and sides are separated by two ridges, forming four or five curves or festoons, with their convexity downwards, and those which separate the sides from the foot are folded into much more numerous curves. The mouth is placed anteriorly between the back and the foot, covered by a wide, delicate, horizontal, semicircular, denticulated membrane, and consisting of a longitudinal cleft, with a pair of lips; within it are a pair of curved horny jaws, compared by Cuvier to the shears used for shearing sheep. The back is completely covered with round, unequal, blunt tubercles, and at its fore part are a pair of apertures, from which the tentacles are projected, and in which they can be concealed; but they are not retractile, each forms a sort of crest, consisting of five processes, and at their base the eyes are situated. From the edge of these apertures the gills commence, and are continued along the upper ridges to the very tip of the tail. The foot is rugous. Their habits have great resemblance to those of the genus *Doris*. Whilst alive, their colours are generally brilliant. Five or six species are known in the European seas, of which the type is our—

Illustration: *Tritonia Hombergii*.

TETHYS. Body fleshy, semitransparent, oval, tapering to a point posteriorly, and terminating in front in a wide semicircular cloak, which, like a sail with a fringed edge, covers and overlaps the head; the mouth trunk-shaped, and beneath the cloak; two projecting tentacles above the base of the cloak; upper part of the body swelling, under part flat, and furnished with a large foot; anal and generative apertures on the right side; branchiæ external, prominent, naked, tufted, and disposed in two longitudinal rows.

This genus is remarkable for the large fringed cloak, which covering overlaps the head, but contracting beneath forms a kind of neck. From the funnel-shaped mouth can be projected a kind of cylindrical proboscis, or trunk, with an aperture at its extremity. They are found in the Mediterranean and the Adriatic.

The type of the genus, of which two species are described, is the—

Illustration: *Tethys Leporina* (Gmelin).

SCYLLEA. Body gelatinous, oblong, greatly compressed on the sides, channelled beneath; back with an elevated crest, with four alary processes disposed in pairs; branchiæ external, expanded in fascicles over the internal face of the dorsal processes; head slightly prominent; tentacula two, dilated above and narrowed towards their base.

Illustration: *Scyllaea pelagica*.

This is the type of the genus; it inhabits the Atlantic Ocean.

GLAUCUS. In describing this genus, authors have almost universally placed this animal upon its back, so that they describe the right side for the left, and *vice versâ*, which occasioned them to think that the organs were placed in a different manner from any other *Mollusca*. The animals of this genus are very much altered by contraction in spirits.

Their characters are:—Animal long, subcylindrical, gelatinous, behind attenuated; head short; mouth trunk-like; tentacula four, the upper eye-bearing; gills fin-like; lobed radiately, three or four pair on each side, placed horizontally; the orifices of generation and vent on the right side.

Found in the Mediterranean, and other seas of warm climates, swimming with great rapidity on the surface, in calm weather.

Illustration: *Glaucus Atlanticus*.

LANIOGENUS. Nearly allied to *Eolida*.

Body naked, long, above convex, beneath flat, ending in a kind of tail; head rather distinct; tentacula four, small; gill pectinate in a short row on each side of the back; described by a single specimen, collected by Sir Hans Sloane, in the collection of the British Museum.

Illustration: *Laniogenus elfortianus* of Blainville.

EOLIS. Body oblong, creeping, ending behind in a point, rather convex above, flat and channelled beneath; mantle not distinct; head short, with four or six tentacula; gills prominent, in the form of scale-like leaves; papillæ or beards placed in longitudinal rows along the back; orifice of generation and vent on the right side.



Eolis.

Blainville has proposed to divide this genus into two, keeping the name of *Eolis* for all the species which have scale-like or papillary gills, and that of *Cavolina* for those which have these organs in the shape of beard-like filaments.

1. **ELOIDA.** Gills scale-like.

Illustration: *Eloida Cuvieri*, *E. Tergipes*.

2. **CAVOLINA.** Gills filiform.

Illustration: *Cavolina perigrina*.

ORDER—TECTIBRANCHIATA. COVERED-GILLS.

THESE Gasteropods, according to Cuvier, have the branchiæ arranged along the right side, or back, in a leaflet form, and covered, more or less, by the pallium or mantle, in which a small shell is always contained.

ILLUSTRATIVE EXAMPLES.

PLATE 5.

APLYSIA (also written, though not so correctly, *Laplysia*). A shell horny, transparent, and in form of a shield, placed horizontally on the back, its convex side being uppermost. Body not divided; head supported by a neck; tentacula four, two hollowed-like ears, and having the eyes at their base, the other two tentacula flattened;—they sometimes have membranes proper for swimming; mouth a vertical slit, having two lateral subcorneous labial plates; branchia in the form of a plume, placed in a dorsal cavity, and protected either by a free operculum at the right side, or by the approximated edges of the mantle.

The species of *Aplysia* are found in the Mediterranean, European and West Indian seas; some are also found in our own seas. The name is derived from a limpid liquor which it exudes when disturbed; and on account of a fancied resemblance between its appearance and that of a hare crouching, it was called by the ancients *Lepus marinus*, or sea-hare. This animal, which has considerable general external resemblance to the *Slugs*, has a long narrow foot, from the front of which projects the head. The development of the lateral borders of the foot is very great, so that they lap over each other at the animal's will, on the dorsal surface of the body, upon which is also a large semicircular valve-like piece of skin, including muscle, arising from its left side only, and often forms a sort of canal, leading the water to the branchial apparatus, which, like the lid of a basket, it almost conceals, and hence arises the arrangement of this and similar animals in the *Tectibranchiate* Order of *Gasteropods*.

Illustration: *Aplysia punctata*.

PLEUROBRANCHUS (the *Lamellaria* of Montague). The animals of this genus have an oval, fleshy body, covered by the mantle, which is strengthened by a thin, expanded, subspiral shell, flattened obliquely; foot broad, equally margined; tentacula two, cleft longitudinally on the outside; mouth anterior, placed below, resembling a proboscis; branchia on the right side, situated in a canal.

Type of the genus, *Bulla plumula*. Four or five species, of which two are found on the southern coast of England.

Illustrations: *Pleurobranchus Peronii*, *Lamellaria membranacea*.

DOLABELLA. Body creeping, oblong, narrowed in front, club-shaped, and enlarged behind, end obliquely truncated, so as to leave an oblique orbicular plane; edge of the mantle plaited, and lobed on the back; tentacula four; half tubular, placed in pairs; lid of the gills, enclosing the shell, covered by the mantle, and placed near the hinder part of the back; anus dorsal, placed behind the gills, in the middle of the orbicular dorsal face. Shell oblong, slightly arched, somewhat ear-shaped; front narrow, thick, callous, and somewhat spiral; the other end broad, flattened, thin, and rounded at the edge.

The *Dolabellæ* are most nearly allied to the *Aplysiæ*, but they differ from the latter in the animals being destitute of fin-like expansions, and in the shape of the body, and in the shell being solid and calcareous, instead of horny and flexible, as in the latter. They are stationary, and often form for themselves a kind of cylindrical tube from the sand and slush of the sea-shore. They are all found in the tropical seas.

The species *D. Peronii* is three or four inches long, and the whole body covered with small fleshy tubercles. They are very difficult to be seen on the shores, for they bury themselves a little depth in the slush.

In the *D. lævis* the skin of the animal is quite smooth, and the shell nearly membranaceous.

Illustration: *Dolabella Rumphii*. This species was figured by Rumphius, hence its name: it is most probably from the Molucca Islands.

NOTARCHUS. The species resemble in many respects those of *Aplysia*. They have not, however, a cloak; their lateral crests are united and cover the back, leaving merely a small dorsal slit or fissure, which is in some oblique, to conduct the water to the branchia, which are very long; foot long and narrow; operculum either rudimentary or wanting.

Illustration: *Notarchus Cuvieri*.

ACERA. Shell (in those which have one) exceedingly light and horny,

more or less convolute, oblique, wanting a visible spire, few whorls, and too small to contain the animal. Branchia covered with a cloak; tentacula short, bent, and widely separated, forming together a sort of fleshy buckler, beneath which the eyes are placed; mouth, crescent-shaped, destitute of sinus or canal.

Illustration: *Acera carnososa*.

BULLEA. The animal of this genus scarcely differs from that of the genus *Bulla*. The shell is more considerably enveloped in the substance of the cloak, and there is no muscle of attachment. It is more open, much less convex externally, and is but very slightly involuted. There is only one species, *Bulla aperta* of former authors; and there appears scarcely sufficient reason for the separation which Lamarck has made. This animal possesses, in common with *Laplysia* (*Aplysia*), the property of ejecting a liquor, when it is alarmed or touched, which tinges the fingers of a blood colour. It is not an uncommon inhabitant of the British coast.

Illustration: *Bulla aperta*.

BULLA. Body ovate oblong, rather convex, divided above into two transverse portions; the cloak folded behind; head scarcely obvious; no apparent tentacula; branchia dorsal, posterior covered by the cloak; anus on the right side; the hinder part of the body covered by a shell which is attached by a muscle; shell univalve, ovate-globose, convolute; no columella, no external spire; aperture the length of the shell; the external margin acute.

There are several circumstances in the structure of the animals of this genus which give them a considerable relation to *Aplysia*. From the more important points of affinity, however, which exist between this genus, *Bullæa*, and *Acera*, Lamarck has formed them into a distinct family under the name of *Bullæens*. The stomach consists of two large flattened testaceous pieces, which, with a smaller one, and united by a strong muscular structure, serve the office of a gizzard in comminuting the food for digestion.

The shells of different species of *Bullæ* differ remarkably from each other. That of *B. lignaria* is very solid and testaceous, and finely coloured; that of *B. acera*, on the contrary, is so thin as to be perfectly elastic, and semitransparent, is of a uniform horn colour, and appears scarcely to possess a trace of carbonate of lime.

De Montfort has made a distinct genus of *B. lignaria*, to which he has given the name *Scaphander*.

Illustrations: *Bulla lignaria*, *Bullina Guianensis*.

UMBELLA. Body very thick, oval, and furnished with a dorsal shell; foot very large, smooth, and flat beneath, everywhere projecting, cleft in front, and attenuated behind; head indistinct; mouth at the bottom of a funnel-shaped cavity in the anterior cleft of the foot; two pairs of tentacles, the upper posterior pair closely approximated, thick, short, truncated, and cleft throughout their whole length, the interior of the cleft filled with transverse folds; the anterior pair very delicate, broad, in shape of a cock's-comb, supported each by a pedicle on the sides of the mouth; branchial organs foliaceous, disposed in form of a long cord, occupying the whole of the anterior and right side of the groove of separation, between the foot and the mantle, and at its hinder end is the vent; shell exterior, orbicular, somewhat irregular, depressed, or quite flat, its upper surface scarcely distinguished by a very minute tip; edges sharp; internal surface slightly concave, and presenting a callous disc, indented centrally, and encircled with a smooth limb.

The examination of the Mollusc belonging to this shell has been made by Blainville, who, as is his usual practice, changed the name of the genus, and applied to it that of *Gastroplox*, for *Patella Umbella*, the *Chinese Parasol Limpet*, because the specimens of the animal in the British Museum had the shell (accidentally) cemented to the under side of the foot. Lamarck, in his *History*, first corrected the error, by some drawing of the animal which he had seen, and the fact has been verified by examining the Museum specimen, which has been figured for the first time in the Plates of this Work, under the name of *Umbella Indica*. Two species are described, one from the Indian seas, *U. Indica*, Lam.; *Patella Umbellata*, Gmel.; and the other from the Mediterranean, *U. Mediterranea*, Lam.

Illustration: *Umbella Indica*.

ORDER—PECTINIBRANCHIATA. COMB-GILLS.

THIS Order is the most extensive of the several Orders into which the Class *Gasteropoda* is divided; it embraces many of those animals whose shells are conical, and all which have spiral univalve shells. It constitutes the Paracephalophora Dioica of Blainville.

The term applied to this Order is incorrectly written on our Plate: instead of *Ptenobranchiata*, it should read *Pectinibranchiata*.

THE TRICHOID TRIBE.

ILLUSTRATIVE EXAMPLES.

PLATE 6.

MONODONTA. Shell oval or conoid; aperture entire, rounded, with the border disunited above; columella arched, and truncated at the base; aperture with an operculum.

Type of the genus, *M. pagodus*, Lamarck. There are several species, all marine shells, inhabiting the tropical seas.

Illustration: *Animal of Monodonta*.

TROCHUS. Shell conical, with an elevated spire, sometimes shortened; its periphery more or less angular, often delicate and sharp; aperture transversely depressed; its edges disconnected above; columella arched, more or less projecting at the base; an opercle. Animal, gasteropodous; spiral; head furnished with two tentacles, having subpeduncular eyes at their base; tongue armed with hooklets; respiratory cavity not furnished with a syphon.

The animal of this genus is very similar to the *Murices*, but distinguished by the absence of a syphon at the front of its respiratory cavity for the introduction of water, and by the edges of its cloak being furnished with lobes. Although the aperture is more or less square, the opercle is always completely circular, slightly convex where attached, and concave in the opposite direction. They are marine animals, living at a short distance from the coast, in clefts of rocks, or wherever marine plants, corallines, &c., are found. They are distributed throughout all seas. Gmelin enumerated eighty species, and though abstracting some for the formation of his genera *Solarium* *Rotella*, Lamarck still describes seventy-eight. *Trochus Imperialis*, Gmel., may be taken as the type.

Illustrations: *Trochus Henslowii*, *T. Emma*.

IMPERATA. This genus has been composed of some of the shells of the genus *Trochus*. The whorls are angulated and stellated.

Illustration: *Imperata Gibberosus*.

PALUDINA. Shell conical, with the whorls convex; aperture rounded, ovate, longer than broad, and angular at the apex; pillar-lip simple; margin not reflected; operculum horny, orbicular.

Type of the genus, *Helix vivipara*, Linn. The species of this genus generally inhabit the fresh waters of Europe, and bring forth their young alive; the animal of the type has two linear subulate tentacula, with eyes at the base; the mouth is triangular; the foot nearly triangular; and the branchia are composed of tufted filaments.

Illustrations: *Paludina fasciata*, *P. Costata*.

TURBO. Shell conical, of a somewhat turricular shape; its periphery never compressed; aperture round, perfect, its edges distinct above; columella arching, flattened, its base not truncated; furnished with an opercle.

The shell of this genus is solid, often very thick and agreeably diversified with brilliant nacreous colours; its twists are always round, never compressed or sharp. The foot or ventral disc of the animal is shorter than its shell, and is obtuse at both ends: the head is furnished with a pair of pointed tentacles which support the eyes at the outside of their base. Lamarck enumerates thirty-four species, of which seven are European. *T. Littoreus*, Lin., may be taken as the type.

Illustration: *Operculum of Turbo*.

LITTORINA, a genus of spiral, univalve, marine, or littoreal shells, allied to *Nerita*, indicated but not characterised by Ferussac. Shell univalve, solid; spire short, conic, or retuse; mouth roundish, entire; inner lip

flattened, outer lip thin; operculum horny, free, spiral; spire of four whorls; the animal pectenibranchous; tentacula two, compressed, retractile; eyes sessile at the outer base of the tentacula.

The type of the genus is *L. littoreus*, the *Turbo littoreus* of Linnæus, the common Periwinkle.

The species of the genus are numerous, and found on the shores of most parts of the world. The animals have the faculty of living a considerable time out of the water.

Illustration: *Littorina littoralis*.

PHASIANELLA. Shell conical, solid; aperture entire, lengthened, contracted by the projection of the body whorl; columella smooth, attenuated at the base; peristome incomplete; operculum calcareous; animal with two long conical tentacula, the eyes supported on pedicles at their base.

Type of the genus, *Helix polita*, Montagu. Of this beautiful genus, four recent and a few fossil species have been discovered in Britain; others inhabit the Indian and Southern Oceans.

Illustration: *Phasianella bulimoides*.

AMPULLARIA. Shell roundish, ventricose; spire short; aperture high; operculum calcareous; columella umbilicated. Animal not unlike the common pond snail (*Paludina*); tentacula long and slender; eyes pedunculated; air or water pouch (which is the chief peculiarity of this genus) at the bottom of the respiratory sac, and at the side of the long branchial comb.

This genus forms a division of Blainville's *Ellipsostomata*, which is defined as a group of spiral univalve shells, containing the genera *Melania*, *Risso*, *Phasianella*, *Ampullaria*, *Helicina*, and *Pleurocerus*. The genus is, however, quite artificial, and contains land, fresh-water, and marine *Mollusca*, breathing by two kinds of respiratory organs.

Illustration: *Ampullaria solida*.

MELANIA. Shell fluviatile, operculate, turreted; aperture entire, oval or oblong, widened at the base, pillar smooth, arched within; operculum horny; animal respiring only water by protruding branchiæ; phytiphagous, with two tentacula; its hinder extremity spirally convolute, enveloped in the shell. All the species are exotic.

Illustration: *Melania Bironensis*.

NATICA. Shell operculated, subglobose, umbilicated, aperture entire, semiorbicular; pillar lip entire, not entering the aperture, with a cavity or callus behind, the latter varying the form of the umbilicus, and occasionally closing it.

Type of the genus, *Nerita glaucina*, Linnæus. Rather a numerous genus, consisting entirely of marine shells, adorned with beautiful colours, and smooth; eight recent, and several fossil species are found on the coasts and crags of Britain.

Illustration: *Natica Millepunctata*.

NERITA. Shell solid, semiglobular, flattened below, not umbilicated, furnished with an operculum; aperture entire, semicircular; inner lip flattened, margined, often dentated; the teeth or crenulations on the inner face of the outer lip.

Type of the genus, *N. littoralis*, Linnæus.

The *Neritæ* are all marine shells, and some of them are very prettily coloured; there are many species, only three of which inhabit the shores of Britain. The type is the common Periwinkle.

Illustrations: *Nerita undulosa*, *N. cariosa*.

NERITINA. Shell thin, semiglobular or oval, flattened below, not umbilicated, furnished with an operculum; aperture semicircular, the left margin flattened; no teeth or crenulations in the internal face of the outer lip; operculum with a lateral point.

Type of the genus, *N. fluviatilis*, Linnæus.

The *Neritina* are river shells; the type is abundant in the rivers of England, especially in the Thames.

Illustration: *Neritina Owenii*.



Paludina.

THE BUCCINOID TRIBE.

CERITHIUM. Shell turreted; aperture short, oblong, oblique, terminated at the base by a short truncated or curved canal; never notched; a slight channel at the upper extremity of the right lip; operculum small, orbicular, horny.

The spire of the shell constitutes at least two-thirds of the whole length; the shell has the form of an elongated pyramidal cone, the surface is in most species striated or tubercular, and in some varicose.

The animals of this genus walk on a small roundish disc or foot. The head is truncated below, and edged with a crest or fringed border; the tentaculæ are two in number, acute, and at the outer part of the base, have a small enlargement bearing the eyes. The type of the genus is *C. palustre* (*Shombus palustris*, Lin.). Lamarck enumerates thirty-six recent and sixty fossil species.

Illustrations: *Cerithium Lamarckii*, *C. fuscum*, *C. telescopium* (opercule of).

THE CAPULOID TRIBE.

ILLUSTRATIVE EXAMPLES.

PLATE 7.

CAPULA. See PILEOPSIS.

PILEOPSIS. Shell exterior, obliquely conical, bent forward, with the summit nearly spiral; aperture rounded, elliptical, with the anterior margin shortest, the posterior larger and rounded; under the hinder edge is an elongate, bent, transverse, muscular impression. Animal with two conical tentacula, the eyes at the base; branchiæ disposed in a row beneath the anterior margin.

Type of the genus, *Patella vel Capulus Hungarica*, Linnæus. The animals of this genus are generally found on rocks, and shells in rather deep water; three species are indigenous, and a fourth is found in a fossil state.

The genus Pileopsis is sometimes called *Capulus*.

Illustrations: *Capulus Hungaricus*, *Pileopsis mitrula*, *P. crenulata*.

HIPPONIX. Shell univalve, conical; apex recurved, subspiral, sublateral; spiral cone very rapidly enlarging; mouth irregular; muscular impression horse-shoe shaped, submarginal. Animal tentacula two, conical; eyes at their outer base; foot small, transverse, folded across the upper surface; reflexed, and attached to marine bodies, which it often covers with a shelly deposit.

This genus of conical, somewhat spiral, univalve shells, was established by Defrance, but since shown to be exactly synonymous with the genus *Capulus* of De Montfort and Lamarck, belonging to the family *Capulidæ*. It has been very commonly referred to the *Brachiopodes*, to which it has not the least resemblance, as has been proved by the dissection of the animal, published by Blainville.

The animal has the peculiar property of secreting a shelly plate, which closes the base of the shell, so as to give the shell somewhat the appearance of a bivalve, to which class some naturalists have been inclined to refer the genus.

The type of the genus is *Patella Hungarica* and *Patella mitrata* of Linnæus; Lamarck describes many fossil species from the Paris basin.

Illustration: *Hipponix cornucopiæ*.

CREPIDULA. Animal with the head forked anteriorly; tentacula two, conical, with the eyes at the outer side of their base; mouth simple, without maxilla, placed at the bifurcation of the head; branchia solitary, subpenicillate, projecting beyond the branchial cavity, on the right side of the neck; mantle never extending beyond the shell; foot very small; anus lateral; shell oval or oblong, convex externally, concave within; spire much inclined towards the margin; aperture partly closed by a horizontal lamina.

Separated from the genus *Patella* of Linnæus. The shell not only covers, but partly unsheathes the animal, by means of the lamina which partly closes the mouth. It is not operculated.

Illustrations: *Crepidula porcellana*, *C. Peruviana*, *C. unguis*, *Dispotea Bironensis*.

CALYPTEREA. Shell conoid, orbicular at the base; vertex central, subacute, imperforate; cavity furnished with a convoluted lip, or spiral septum.

This genus of univalve shells was separated from the *Patellæ* of Linnæus.

Patella Chinensis, which is a British species, is a good example of this genus.

Illustration: *Calyptera Neptuna*.

SIPHONARIA. Shell patelliform, elliptical, ribbed; apex nearly central, well marked, obliquely inclining towards the posterior margin; muscular impression of a horse-shoe partly encircling the central disc but interrupted in front; a canal or siphon on the right side passing from the apex to the margin, and which divides the right lobe into two. Animal oval, depressed; head two lobes; tentacles wanting; a narrow veil on the head; mantle crenulated on the borders; branchiæ situated between the foot and the mantle in the form of a square membrane. The hood of the animal is described by Quoy and Gaimard as being of considerable size, which is rounded and furnished above with sessile eyes; it emits at pleasure a viscous secretion of a white colour; it has two salivary glands which open into the œsophagus, and its liver has four lobes. The siphon, which some of the species possess, distinguishes Siphonaria from Patella.

Illustrations: *Siphonaria radiata*, *S. gigas*, *Gadina afra*.

SIGARETUS. Shell somewhat ear-shaped, patulous, almost orbicular, the left margin short, spiral; aperture anterior, very wide, longer than broad, the margins united; mantle enveloping the shell, its anterior sinistral margin notched at the branchial opening; tentacula two; eyes at their outer base.

Type of the genus, *Bulla haloitidea*; Montagu. Two species, both of which are found on the coasts of Britain, though not very commonly.

Illustration: *Sigaretus haloitideus*.

CORIOCELLA. Distinguished from Sigaretus by a horny and membranous-like shell; in all other respects similar.

Illustration: *Coriocella nigra*.

The PTEROPODOUS SUB-CLASS consists of but few animals, remarkable for the wing-like expansions placed on each side of the narrow neck, which connects the head with the visceral bag: these organs, in *Hyalea* and *Pneumoderma*, are doubtless the locomotive organs, for in the latter a pair of distinct branching gills exist externally on the caudal extremity of the body; and in the former the gills are situated on each side of the body in a cleft of the visceral bag. But in *Clio*, the wings serve both as locomotive and branchial organs, presenting, under the microscope, as Cuvier observes, a very delicate, close, and regular vascular network, connected with the internal vessels and the heart; neither is there any other organ which has any resemblance to gills. Some genera, as *Hyalea* and *Cleodora*, contain shells in the walls of their visceral bag, which others, as *Clio*, have not.



Hyalea.

SUB-CLASS—ACEPHALA. HEADLESS.

ACEPHALS. This remarkable class of Molluscan Animals is distinguished by the absence of any head, and by the toothless mouth being almost always concealed within the folds of the mantle, which in different form encloses the animal, and is itself enveloped by an external covering, in one Order gelatinous or coriaceous, and in the others testaceous or shelly. Their food consists generally of minute animals, which are brought to their mouths by the currents in the surrounding water, excited by the motions of the mantle. All the class are aquatic; and upon the different form and disposition of their branchiæ or gills, their distribution, by Blainville, into Orders depends.

1. The Heterobranchiate Order:

These are the TUNICATA of Lamarck (so distinguished on Plate 8), who places them between his RADIATA and VERMES; but admits that by one

section (the *Ascidian*) they are connected with the Molluscs. Cuvier, however, observing that they are provided with a brain, heart, vessels, liver, &c., considers them entitled to a higher place in the animal scale, and has ranged them with his ACEPHALOUS MOLLUSCS (a disposition in which Blainville also concurs), but distinguishing them as Shell-less. They exist either as single independent animals, capable of voluntary motion, as the *Salpæ*; or are attached to rocks, sea-weed, &c., and are either sessile, *i.e.*, fixed by their broad base like *Cynthia* (Plate 8, fig. 1), or pedicellate, *i.e.*, have a long pedicle, as *Clavelina* (fig. 2), for their attachment. Others, of the genus *Salpa*, are remarkable for their capability of aggregating themselves together in one common cartilaginous mass, like the polypary of *Alcyonium*. This mass may be either sessile, as *Distoma* (fig. 4), or pedicellate, as *Sigillina* (fig. 13), and in them it is simply indented with cells. But in others, as *Botryllus* (fig. 8), the central part is hollowed out as a shallow saucer-like cavity, into which the anal apertures of the several animals disposed around it in a circular or oval form empty themselves. The external layer varies materially in its character, and is either almost gelatinous, as in *Sigillina*, or cartilaginous, as in *Phallusia*. The internal layer is either muscular throughout, as in *Cynthia microcosmus*, or membranous, with some muscular bands stretching only over particular regions, as in *Phallusia sulcata*, and in the different kinds of *Salpæ*, or simply membranous, as in *Sigillina Australis*.

2 and 3. The *Palliobranchiate* and *Lamellibranchiate* Orders, which include the remaining living Acephals. The name assigned by Blainville to the former Order arises from "the branchiæ being applied to the inner face of the lobes of the mantle;" while the *Lamellibranchiate* Order has its name from the gills, *branchiæ*, being disposed upon the body of these animals like the leaves of a book.

As the animals belonging to these Orders are contained within a pair of shells or valves, as they are called in zoological language, they are said to be *bivalves*. It will therefore be necessary to give some account of their form and characters.

The Valves (Conchol. Terms, Plate 1) are placed one on each side of the animal, and united together by an elastic ligament, which, to a greater or less extent, connects the inner edge of the upper or *dorsal margin* of one valve with that of its fellow, the whole of which apparatus is called the *hinge*. The anterior end of the valve is called the *oral extremity*, from being near the mouth, and the posterior end the *anal extremity*, from its proximity to the vent of the animal. In most Bivalves the shells shut closely, and no apertures exist; but in others, as the *Razorshell*, *Solen*, both ends are open, the valves together having the shape of a truncated, flattened cylinder; and in others, as *Galeomma*, the ventral margins do not touch. The form of the valves varies considerably: they may be long, as in the *Piddock*, *Pholas* (Conchol. Terms, Plate 1), and *Mussel*, *Mytilus*; or deep, as in *Vulsella*; oval, as in *Cytherea* (Plate 1); rounded, as in the *Scallop*, *Pecten* (Plate 1); thick, as in the *Cockle*, *Cardium*; compressed and very delicate, as *Tellina*; cylindrical, as the *Razorshell*, *Solen*; boat-shaped, like the *Ark*, *Arca*; heart-shaped, like the *Cockle*, *Cardium*; wedge-shaped, as the *Wedgeshell*, *Donax*; tongue-shaped, like *Vulsella*; beaked, when the hinder extremity of the shell is much narrower than the front one, as in *Tellina fragilis*; or fan-shaped, when the hinder end is very broad and as it were truncated, as in the *Nacreshell*, *Pinna*; eared, either singly or doubly, when the edge of the shell nearest the beak or summit expands into one ear, as in *Unio delphinus*, or into two, as in the *Scallop*. The external surface of the valves is smooth, as in *Cytherea Chione*; scaly, as in the *Oyster*, *Ostrea*; radiated, like the *Scallop*; ribbed, as the *Cockle*; grooved, as the *Astarte Danmoniensis*; striated, as the *Razorshell*; or tessellated, as the *Reticulated Ark*. According to their correspondence in form, Bivalve shells are said to be *equivalve* when both are alike, as in the *Mussel*; or, when there is but little difference between them, *subequivalve*, as in some of the *Scallops*; but if one valve be flat and the other concave, as in the *Oyster*, they are called *inequivalve*. The internal surface of the valve has a generally correspondent concavity with the convex exterior, but it has also some peculiarities of its own. When the ventral cavity rises

into the beak, it is said to be arched, *fornicata*, as in *Isocardia*; when a leaf-like process springs up from its bottom, as in the *Arks*, it is called chambered, *concamerata*; when a lengthened edge descends obliquely from beneath the beak, so as nearly to reach the abdominal edge, as in *Anatina*, then the valve is said to be solidified, *solidificata*; if, as in the *Piddocks*, a curved hooking process stretches from the cavity of the beak into the hollow of the valve, it is appendiculate, *appendiculata*. In the *Terebratulæ* (Plate 1, *Lamplike-shells*), the right or imperforate valve is furnished with a very remarkable apparatus, consisting of a testaceous loop, commencing near the hinge, stretching into the middle of the shell, and thence turning back upon itself. They are also further remarkable for the aperture near the hinge of the left valve, through which little muscles pass to be connected with the pedicle, which is extended from it like the pedicle of the *Barnacle*. Bivalve shells are closed by the aid of muscular bands which pass from one valve to the other, and their attachments are in pits, more or less deep, in the concavity of the valves; these pits are called *muscular impressions*. Sometimes there is but a single muscle; each valve has then only a single impression, as in the *Oyster*, such are called *Monomyary* valves; or there may be two muscles, one in front and the other behind, as in *Venus*, and many others, such are named *Dimyary*; in some, as *Unio* and *Anodon*, there are three muscles, and the valves therefore *Trimyary*.

Another remarkable character of all the Acephalous Molluscs, excepting the *Heterobranchiate* Order, is their possession of a true mantle, *pallium*, which is really only an elongation of the common tegument of the animal turned backward loosely upon itself: the Mollusc, therefore, besides its close tegumentary investment, is included between the flaps of the mantle like a book within its fly-leaves, and the connection of the external surface of the mantle-flaps with the interior of the valves corresponds to that of the fly-leaves with the book-covers. Such is the simple description of the mantle; but it must be recollected that though it envelops the animal as far as its dorsal edge before its reflexion upon the valves, yet that in taking this course it must wrap round the muscle or muscles connecting the valves. This simple double-flapped mantle is easily distinguished in the *Oysters*, *Arks*, and *Scallops*. But the mantle is subject to a variety of form, as any one may satisfy himself by comparing the *pallium* of the Razor shell, Cockle, Mussel, and Scallop.

ORDER—HETEROBRANCHIATA.

ILLUSTRATIVE EXAMPLES.

PLATE 8.

CYNTHIA. A subgenus of *Ascidæ* according to Savigny, the generic characters of which are:—body enveloped in a double tunic; fixed to marine bodies at the base. Exterior tunic somewhat coriaceous, forming an irregular ovate, or cylindrical sac, perforated above by two unequal foramina, one lower than the other. The interior, or proper tunic enclosing the body, not entirely filling the external sac, to which it is united only at the foramina.

The species of *Cynthia* are sessile Ascidians, their branchial sac is plaited longitudinally, and they are found either attached to submarine plants, or floating about in the gulf of Suez.

Illustrations: *Cynthia momus*, *C. canopus*.

BOTRYLLUS. The common substance gelatinous or cartilaginous, encrusting other bodies, and composed of systems which are round or elliptical, raised above the common surface, and annular. Animals disposed either in a single series, or in several which are regular and concentric. Branchial orifice simply circular, and without rays; intestinal orifice small, elongated to a point, and enveloped in the border of the central cavity of the system.

There are several species found on our coasts, as *B. conglomeratus*, &c.

Illustration: *Botryllus polycyclus*.

POLYCLINUM. Animals aggregated, biforous, sunk in a gelatinous mass, flattened, rough with small papillæ; the greater part disposed in a radiated form round a central opening; mouth with six tentacula; anal aperture not apparent externally; one gemmiferous sac hanging beneath the animal terminating in a filament.

Type of the genus, *P. violaceus*, Lamarck. Inhabits the European seas.
Illustration: *Polycinum constellatum*.

SIGILLINA. Animal agglomerated, biforous, forming by their union a common gelatinous body, elongate-conical, somewhat pedunculated, with scattered tubercles; animals not disposed in any particular or distinct system; tubercles of the surface with two pores; mouth with six tentacula; anal orifice with six teeth.

Type of the genus, *S. Australis*, Lamarck. Inhabits the coasts of New Holland.

Illustration: *Sigillina Australis*.

DISTOMA. Body common, sessile, half cartilaginous, polymorphous; composed of many animals generally placed in a circular disposition; animals placed in one or two ranges, at a coequal distance from their common centre; the brachial mouth furnished with six regular equal rays, the anal aperture similar; the thorax small, cylindrical, netted with a papillary brachial surface; abdomen below, longly pedicelled, longer than the thorax; liver none; ovary unique, sessile, lateral, occupying the whole of one side of the abdomen.

Distoma rubrum is the type. *Distoma variolosum* was first found by Gaertner on the stems of the *Ficus Palmatus*, on the coast of England.

Illustration: *Distoma rubrum*.

SYNOICUM. Bodies long and vertical, united in small numbers, and forming a kind of fluted cylinder, excavated at the extremity by a star-shaped orifice, produced by the union of the anal orifices.

The characters of this genus are, the two mouths of each animal opening at the bottom of a cavity more or less deep, formed by the union of their coverings, which has only one external aperture, commonly furnished with six tentacular papillæ.

Illustration: *Synicum Turgens*.

SUB-CLASS—CIRRHOPODA.

THE Cirrhopodous Molluscs are enclosed in valves, four in some kinds and five in others, and they are either sessile (immoveably attached) or peduncular (can swing like a clock pendulum when attached to a particular spot). The *Sessile* family (*Acamptosomata* of Leach) have their four valves contained in a short calcareous tube, upper end open, lower closed either by membrane, as in *Coronula* (Plate 9, fig. 7), or by earthy matter, as in *Balanus* (*Ib.* fig. 12); in either case this base is penetrated by little conical chambers, side by side, into which processes of the mantle pass, and fix the tube to the rock; whilst the moveable valves are supported on the upper part of the mantle. In the *Peduncular* family (*Camptosomata* of Leach), a long pedicle or foot proceeds from the mantle as it shuts up the lower aperture of the five valves, as in the *Barnacle*, *Pentalasmis* (*Ib.* fig. 3). The pedicle is covered externally with a hard horny cuticle, and contains within a mass of muscular fibres attached by one extremity to the bottom of the mantle, and by the other to its own base, by which it fixes itself.

ORDER—PEDUNCULAR. CAMPTOSOMATA.

ILLUSTRATIVE EXAMPLES.

PLATE 9.

PENTALASMIS. Shell conical, subtriangular, composed of five valves; animal compressed, peduncle elongated. This genus of Cirrhopods are found attached to wood floating on the sea; they are distinguished by numerous valves, and by their very much elongated pedicle. They constitute the genus *Anatifera* of Lamarck, and the *Lepas Anatifera* of Linnæus. They are generally to be found in most seas, and are abundant off the coast of Africa. They attach themselves to the bottoms of ships.

Illustration: *Pentalismus vulgaris*.

CINERAS. Body pedunculated, wholly enveloped in a membranaceous tunic, which is turgid, and open in front beneath the apex; arms numerous, slender, articulated, ciliated, protruded at the aperture; shell consisting of five testaceous oblong valves, which are separate, and do not wholly cover the body; two placed at the sides of the aperture, the others at the back.

This genus was established by Dr. Leach, and, with the genus *Otion*, to which it is somewhat allied, forms the family *Clytidii*.

Illustration and type: *Cineras vittata*.

OTION. Body supported on a tubular peduncle, enveloped in a membranous tunic, ventricose above, with two tubes disposed in the form of horns directed backwards, open at their extremity, truncated and placed at the summit of the tunic; a lateral opening, with many articulated ciliated arms; shell with two small testaceous semilinear valves, adhering near the lateral opening.

Illustration and type: *Otion Cuvieri*.

Inhabits the Northern Ocean, and has been found on the southern coast of England.

SCALPELLUM. Shell flat, quadrated, composed of thirteen valves, six on each side and one dorsal; pedicle short and scaly.

The animal of this genus resembles that of *Pentalasmis*. There are two species, one of which is found in the Straits of Magellan, and the other is common in the European seas.

Illustration: *Scalpellum vulgare*.

POLLICIPES. Body supported on a long, tubular, tendinous, peduncle, covered by a shell, composed of numerous unequal valvular plates, thirteen or more in number, and the smallest placed low on the sides; the peduncle itself dotted with rounded cimbriated scales.

Illustration and type: *Pollicipes cornucopia*.

Found in the seas of Europe and Britain; not very abundant in the latter country.

ORDER—SESSILE. ACAMPTOSOMATA.

ILLUSTRATIVE EXAMPLES.

TUBICINELLA. Shell univalve, operculated, tubular, straight, slightly attenuated towards the base; banded circularly with transverse ribs, truncated at both ends, open at the top and closed by a membrane at the base; opercule consisting of four unequal valves; the inclosed animal projects from the upper aperture; small, unequal, setaceous cirrhi.

The shell of this genus differs from that of all the other *Cirrhipeds*; it appears open at both extremities, but during the life of the animal its lower extremity is closed by membrane. The valves of its opercule are trapezoid, obtuse, and moveable, inserted in the upper part of the inner wall of the shell. The animal attaches itself to the bodies of whales, and as it grows penetrates through the skin to the subjacent fat.

Illustration and type: *Tubicinella Lamarckii*.

CORONULA. "Shell subcylindrical or subconic, depressed; base much wider than the apex; lips of the operculum very prominent, with two large shelly valves before, and one small one on each side of the legs." Leach.

The opening of these shells is always regular, elliptical, slightly hexagonal; and the valves of the operculum, which rather belong to the animal than to the shell, are inserted near the base of the internal parietes of the shell. The substance of the shell is divided in the interior into a number of cells, separated by their shelly plates, and arranged in a radiated position. The base is not closed by a calcareous plate, but by a membrane formed by the animal.

The *Coronulæ*, like others of the family, are generally found on the surface of marine animals, as Whales, Turtles, &c., and they partially bury the base of the shell in the skin of the animal to which they are fixed, where it is sufficiently soft.

Illustration: *Coronula diadema*.

PYRGOMA. A single conical shell, compressed and thick; hollow paries with a small aperture, closed by an operculum of two valves of variable form; supported by a cup-shaped base; grooved perpendicularly within.

This genus has been established by Savigny; it may be distinguished from *Creusia* by the parietal cone, which is simple and not divided into valves. It is found attached to Corals.

Illustration: *Pyrgoma cancellata*.

CREUSIA. Body sessile, subglobose, enclosed in an operculated shell; three or four pairs of tentaculiform arms; mouth at the upper and anterior

part of the body, not prominent; shell sessile, fixed, orbiculate, convexo-conical, four-valved; valves unequal, united; sutures distinct; operculum internal, bivalve.

This genus was established by Dr. Leach, and, excepting *Pyrgoma*, is the only one of the *Balanidii* with bivalve operculum. Type, *C. Verruca*.

Illustration: *Creusia spinulosa*.

ACASTA. A small genus formed by Leach from *Balanus*, but which Sowerby has again reunited. They are found imbedded in sponges, have a subconical shell which consists of eight unequal valves; base cup-shaped (an accidental character according to Sowerby); no internal plate; shelly part foliaceous. See also *Balanus*.

Illustration: *Acasta Montagu*.

BALANUS. Body sessile, inclosed in an operculated shell; arms numerous, in two rows, unequal, articulated, ciliated, each composed of two cirrhi placed on a peduncle, and capable of being exerted beyond the operculum; mouth not prominent, having four toothed transverse jaws, besides four hairy palpiform appendages. Shell sessile, fixed, univalve, conical, truncated at the apex, closed at the base with an adherent testaceous lamella. Aperture somewhat triangular or elliptical: operculum internal, composed of four valves, which are moveable, and inserted near the internal base of the shell.

The shell of the *Balani* is immoveable in all its parts; it forms a cone, generally more or less short and truncated, fixed, without any intermediate

peduncle, on marine bodies. It appears to be univalve, but is in fact composed of six different portions, exclusive of the base, which are united by a very exact suture, and are, as it were, soldered inseparably together in old shells, especially in some of the larger species.

The animal would be exposed to numerous injuries, were it not for the operculum, which consists of four moveable pieces, allowing the animal to protrude its cirrhi at pleasure.

The general form of the operculum is a short cone. The manner in which the *Balani* increase their shells is not understood. The species are very numerous, of which several are natives of our coast. Lamarck enumerates nearly thirty, and there are probably many more undiscovered, as well as others not yet properly distinguished. They are found adhering to rocks, corals, shells, &c., and are frequently brought at the bottoms of ships from different parts of the world; in which situation many very interesting species have been discovered.

Illustration: *Balanus tintinabulum*.

CONIA. Shell quadripartite, divisions equal; operculum bipartite.

Type: *Balanus porosus*.

Illustration: *Conia vulgaris*.

CLISIA. Shell fourpartite; valves of the operculum undivided.

Some species inhabit the coast of Great Britain, being found attached to marine plants, crustacea, and testaceous mollusca.

Illustration: *Clisia verruca*.



Balanus.

CLASS VI.—INSECTA.

ARTICULATED ANIMALS WITH ARTICULATED FEET.

INSECTS form a very important Class among Articulate Animals. They are characterised by the division of their body into three principal parts, the head, chest, and belly, *caput, thorax, abdomen*; which are less determinately marked in some Insects, as in the *Beetles*, than in the *Wasps*, in which the chest is connected by one pedicle in front with the head, and by another behind with the belly. They are also furnished with three pairs of legs, and generally with two pairs of wings, all which are attached to the chest. No Insect, however, is thus perfectly formed when first bursting from the egg, in which its animal existence commences, but passes through two stages, during which it, in most instances, differs remarkably from the form which becomes its own in the third stage. These changes are called the Metamorphoses of Insects, and are said to be *Complete* or *Incomplete* as the animal assumes a more or less perfectly distinct form in its several stages: a familiar instance of the first kind is presented in the *Silkworm*, its chrysalis or grub, and its moth or perfect grub, and its moth or perfect form; of the second, the *Common Cockroach*, in which the animal proceeds through its primary stages of nearly the same form throughout, except that it does not obtain wings till it acquires its perfect form. The three stages of Perfect Metamorphoses are,—1. The *Larva*, Caterpillar or Maggot; 2. The *Pupa*, or Chrysalis, which is remarkable on account of the animal becoming perfectly quiescent and ceasing to feed; but during this state, a most wonderful change is going on within its external covering, which leads to the production of 3. The *Imago*, or Perfect Insect. In the Imperfect Metamorphoses, the larval stage is indicated by the absence of scutellum and wings in the Winged Insects; the second stage has been named by Lamarck the *Nympha*, and is distinguished in Winged Insects by the rudimental appearance of wings, which are fully developed only in their perfect state. There is only space here to observe further, in reference to the imperfect state of Insects, that the body consists of a series of rings, usually thirteen; that some are headless, and that others have heads, as the Maggot of the *House-fly*, and the Caterpillars of the *Butterflies*; that some have not any feet, as the Maggot, and that others have feet, some on the three rings immediately following the head, as in *Cetonia Aurata*, such being specially called *Larvæ*; and some, besides these, six horny legs, having membranous appendages called *prolegs*, on the ventral and anal segments, as in the *Silk Moth*; to such the name Caterpillars, *Erucae*, is particularly attached.

ARRANGEMENT OF THE PLATES.

Plates I. and II. contain examples of the several orders as found in Lamarck's arrangement; and the three succeeding Plates exhibit a more extended and general classification. Definitions of orders in the first arrangement are not repeated in the second.

LAMARCK'S ARRANGEMENT OF INSECTS.

ORDER I.—COLEOPTERA. SHEATH-WINGED.

This class of insects include all those whose wings are covered by coriaceous elytra, or wing-covers.

ILLUSTRATIVE EXAMPLES.

PLATE I.

LUCANUS. No apparent lip; languet divided into two long, silky lobes; chin covering, by its length, the larger part of the jaws.

Type of the genus is the common Stag Beetle, also our—

Illustration: *Lucanus cervus*, found in groves and amongst trees in the summer evenings.

LAMPYRIS. Thorax half circular, entirely hiding the head; mouth very small; maxillary palpi ending in a pointed joint; the hinder extremity of the abdomen phosphorescent, and the eyes large, especially in the males.

The name *Lampyris* was given to the insect by the Greeks, from its phosphorescent light. The females, which are apterous, are usually called Glow-worms. The end of the body retains its luminous quality for a considerable time after it is cut off from the body of the insect; and it is said that the luminousness of it appears to depend more on the softness and moist condition of the part than on the life of the animal; some experiments declare that it crepitates when placed in hydrogen gas.

The type of the genus, which is also our—

Illustration: *Lampyris noctiluca*, is common in English hedge-rows in the summer evenings.

CERAMBYX. Antennæ long, setaceous; inserted into a notch in the eyes; head bent forwards; palpi terminated by a thick, obconic, compressed articulation.

Type of the genus, *C. Cerdo*, Fab.

C. Moschatus is one of the most elegant of our British insects. It is of a metallic green colour, passing into rose or violet. It has a smell resembling that of the rose.

Illustration: *Cerambyx*.

ORDER II.—ORTHOPTERA. STRAIGHT-WINGED.

THESE are distinguished from the former Order by having soft, membranous wing-covers much nerved; wings longitudinally folded, whence their peculiar designation, given them by Olivier, ὀρθός, *straight*, and πτερόν, *a wing*. They were included in the Coleoptera, by Geoffroy, but separated from them by De Geer.

ILLUSTRATIVE EXAMPLES.

GRYLLOTALPA. Anterior legs very large, and adapted for burrowing; tarsi of the other legs of the ordinary form.

The name of Mole-Cricket has been applied to the species of this genus because of the resemblance which their feet have to those of the mole.

Illustration: *Gryllotalpa vulgaris*.

BLATTA. Antennæ setaceous, inserted beneath the eyes; labium rounded before; labium bifid; body oblong, suboval, depressed; thorax nearly flat, smooth, shield-shaped, marginate, covering the head; elytra horizontal; abdomen furnished with two short conical appendages; feet formed for running, tarsi with five joints.

The common Cockroach, *B. orientalis*, which is the type of this genus, is but too well known in our kitchens.

Illustration: *Blatta lapponica*.

FORFICULA. Tarsi of three joints, wings plaited fan-like, and folded crosswise, so as to be placed under the crustaceous elytra, which are united by a straight suture; body linear, ending in two hooks; head exposed; antennæ filiform, formed of twelve or thirteen joints.

The type is *F. auricularia*, the common Earwig, known to everybody; called also as in our—

Illustration: *Forficula vulgaris*.

GRYLLUS. Hind legs proper for leaping, wings and elytra horizontal, the wings plaited longitudinally, and each forming in repose a kind of plate prolonged behind the elytra; tarsi of six joints; antennæ setaceous, consisting of very numerous joints inserted between the eyes; tongue four-lobed, the two middle lobes very small; lip entire; the female with a prominent ovipositor.

The bodies of the Crickets are large, and nearly of the same diameter throughout; their head is large, vertical, and rounded behind. The males are provided with a small *tambourine*, placed at the inner part of their *elytra*. They generally live on insects, and are often nocturnal. The most common species in this country is the *Gryllus Domesticus* of Linnæus.

Illustration: *Gryllus cærulescens*.

MANTIS. Body long, narrow; head exposed, with the front rounded, not prolonged into a cone; the antennæ of both sexes simple; the front feet longer than the others; tarsi all with five joints; the elytra and wing lying horizontally in repose.

The type of the genus is *M. oratoria*, Linnæus.

Illustration: *Mantis striata*.

ORDER III.—NEUROPTERA. LACE-WINGED.

THE wings of the Order Neuroptera are not covered by elytra, as are those of the Coleoptera; but they are furnished with a great number of nerves, which give them the appearance of net-work, whence their name, νεῦρον, *a nerve*, and πτερόν, *a wing*.

ILLUSTRATIVE EXAMPLES.

MYRMELEON. Antennæ shorter than the body, somewhat gradually thickening towards their extremities, arcuated, and furnished at the tips with a distinct little point; palpi six; labial longest, somewhat thicker at their extremities; eyes undivided; abdomen very long, linear; trunk short, villose; tibiæ hairy, terminated by two strong spurs; tarsi five-jointed.

The insects of this genus feed on other insects in all their states; they deposit their eggs in sandy places, and the larvæ, when hatched, form an ingenious snare for the purpose of capturing their prey.

Type of the genus, which is also our—

Illustration: *Myrmeleon fornicarium*.

LIBELLULA. Wings extended horizontally in repose; head nearly globular, with very large contiguous eyes, the lips closing the mouth.

The type of the genus is *L. depressa*, Linnæus. Found common on heath and hedges near water.

Illustration: *Libellula depressa* (larvæ of).

NEMOPTERA. Palpi six, short; antennæ setaceous, inserted between the eye; ocelli wanting; head vertical; clypeus produced into a rostriform, perpendicular lamina, bearing the trophi; body elongate, narrow; thorax composed of two segments, the first very short, the second large; wings reticulated, extended, anterior ones somewhat ovate, posterior very long and linear; legs short; tarsi elongate, composed of five slender, entire joints; claws elongate and simple.

Illustration: *Nemoptera vulgaris*.

ASCALAPHUS. Characters generally as those of Myrmelion. They are distinguished by their long antennæ, which are terminated by a knob; their abdomen is oval, and oblong; the thorax is nearly the length of the abdomen, and their wings are somewhat shorter than those of the Myrmelion. They are inhabitants of warm countries.

Illustration: *Ascalaphus barbarus*.

ORDER IV.—HYMENOPTERA. MEMBRANOUS-WINGED.

THESE insects have four veined, naked, and membranaceous wings; the females are provided with an ovipositor at the extremity of their abdomen, which consists of a sting protected by two elongated processes, one on each side.

ILLUSTRATIVE EXAMPLES.

SPEX. Antennæ filiform, slender, approximated at their insertion, often arched or spirally twisted; upper lip very short; mandibles either simple or toothed at their inner edge; four slender palpi; promuscles more or less long, trifid, flexed either in the middle or towards the tip.

The animals of this genus are carnivorous in their imperfect state, but subsequently feed only on the juices of flowers. The female digs her nest rather deep in the ground, where she deposits one egg, and puts beside it a caterpillar or a spider, which she has previously killed, to provide nourishment for the young animal as soon as hatched, and then carefully covers it over with grains of sand, or even with a little bit of stone. This process is successively performed in the same nest till she has completed her incubation. The type of those species which have the mandibles toothed, is *S. Sabulosa*, Lin.; and the type of those in which the mandibles are smooth, is that shown in our—

Illustration: *Sphæx spirifex*.

URO CERUS (the SIREX proper of Geoffroy). Antennæ filiform or setaceous, as long as the thorax; palpi unequal, very short; maxillary ciliated and two or one-jointed; labial thrice as long and more slender; eyes small; ocelli three; thorax rather wider than the head; wings with two marginal and two submarginal areolets; abdomen long, cylindric, terminating in an

elongate point or style; legs moderate, posterior pair slender in the females, in the males with their *tibiæ* and *tarsi* much dilated.

The insects of this genus are of large size; nearly twenty species have been discovered, of which at least six inhabit England.

Type of the genus, and—

Illustration: *Urocetus* (or *Sirex*) *gigas*.

POMPILUS. Antennæ inserted near the hinder suture of the clypeus; generally convoluted at the apex in the females; subsetaceous, not broken; maxillary palpi longest, pendulous, the third joint stoutest, obconic or ovate, the three terminal ones of nearly equal length, and almost equal with the labial; labrum inserted beneath the clypeus, most frequently notched; wings four, anterior with two submarginal areolets.

A very numerous genus, of which about twenty-five are found in England, chiefly in sandy situations.

Type of the genus, and—

Illustration: *Pompilus viaticus*.

ORDER V.—LEPIDOPTERA. SOFT OR FEATHER-WINGED.

THE lepidopterous insects are thus characterised: Wings four, membranaceous, covered with a farinaceous powder, formed of scales; the mouth furnished with a spiral trunk, formed of the lengthened jaws. This part has usually been called the tongue, but Savigny, in his excellent work on the examination of the mouth of insects, has fully established the fact that it contains all the organs found in the mouths of those insects which gnaw their food.

ILLUSTRATIVE EXAMPLES.

PLATE 2.

LYCÆNA. Antennæ clavate, the capitulum arcuate, ovate-conic; anterior legs not abbreviated; claws distinct and simple; pupa smooth, braced, and foliculated; egg elongate conic; caterpillar fleshy, having a furcate, retractile organ in the neck; chrysalis angulated, with two processes before, fastened by a transverse thread.

Illustration: *Lycæna dispar* (in various stages).

HESPERIA. Antennæ ending in a club or button, hooked at the tip; the lower palpi short, large, and covered with spines. Their bodies are generally short, thick; their heads broad, and the antennæ far apart at their insertion. These insects are commonly found in grassy places, especially in damp shady places. A few found in Europe; numerous in America.

The type is the *Papilio alceæ*, Esper, the *H. malvæ* of Fabricius.

Illustration: *Hesperia comma*.

NOCTUA. Antennæ setaceous, gradually attenuated from the base to the apex; wings, during repose, mostly deflexed; last joint of the palpi very short and covered with scales; flight nocturnal.

Illustration: *Noctua delphinula*.

BOMBYX. Lamarck includes in this genus the *Phalænida* having bipectinated antennæ, two short palpi, a very short tongue (in some species being scarcely perceptible); a thick body, closely covered with hair or wool, and wings either horizontal or deflected. The larvæ have sixteen feet, and the pupa is enclosed within a cocoon. Some of the *Bombyces* are amongst the largest of the *Lepidoptera*. *B. Atlas*, for instance (belonging to the Linnæan division *Attaci*), measures from tip to tip of the wings upwards of eight inches. This magnificent moth is a native of Asia; the larva feeds on the orange; the pupa is enclosed in a large strong cocoon. The wings are yellowish and clouded, and there is a large transparent silvery spot on each. Of the European *Bombyces*, the most beautiful is the *Phalæna Junonia* of Shaw, separated by him from the *B. pavonia*, of which it is probably only a large variety. But the species to which the greatest interest attaches is *B. Mori*, the silk-worm moth, from which the whole of the European silk, and the greater part of that of China, is produced.

Illustrations: *Bombyx dispar*; *B. furcula*.

ORDER VI.—HEMIPTERA. HALF-WINGED.

THE ordinal character of the insects composing the Order Hemiptera are—Wings two, covered with elytra; mouth proper for suction, without distinct jaws; mandibles formed of a tubular, jointed, cylindrical, or conical trunk, curved on the front of the chest, containing three bristles, forming together a needle-like sucker.

ILLUSTRATIVE EXAMPLES.

FULGORA. Elytra of the same consistence; tarsi of three joints; antennæ placed under the eyes, of two or three joints, the last joint largest, nearly globular, ending in a bristle; beak long, of two or three joints; head acute; head prolonged into a variously-formed beak; ocelli three.

These insects are remarkable for the beautiful colour of their wings and form. The protuberance of their head gives out an intense phosphorescent light. They are found in warm climates.

The type is *F. Lanternaria*, of the East Indies.

Illustration: *Fulgoria candellaria*.

NAUCORIS. Antennæ very short, concealed in a cavity beneath the eyes, quadriarticulate, cylindric, with the apex a little gracile; labrum large, exerted, trigonal, flat; rostrum triarticulate, shorter than the head, the basal joint very short; body ovate, considerably depressed, above flat, with the lateral margins acute; head transverse, rounded anteriorly, rather deeply inserted into the thorax, this last transverse, subquadrate, a little narrowed anteriorly, and deeply emarginate; abdomen large, broad, acute behind; the lateral margin greatly depressed, somewhat membranaceous; legs, anterior short, four posterior compressed; femora with a double row of denticulations; tibiæ and tarsi spinulose, and furnished with hairs on the margin for swimming.

Several species; two of them natives of England.

The type of the genus is shown in our—

Illustration: *Naucoris cimicoides*.

NOTONECTA. Antennæ very short, concealed beneath the eyes, attenuated towards the extremity, four-articulate, the basal joint very minute, round, large, cylindric, third more slender, subcylindric, a little attenuated at the base, fourth half as long, more slender, conic-cylindric; rostrum as long as the head, conical, depressed, triarticulate; body cylindric-ovoid; head vertical; eyes large, ovate; thorax transverse, a little narrowed in front; scutellum distinct, trigonal; elytra inclined; four anterior legs with two strong claws at the apex; posterior with small claws, formed for seizing; tarsi all four-jointed.

The insects of this genus swim well, and upon their backs, whence the name of the genus.

The type of the genus (*Boat Fly*) is our—

Illustration: *Notonecta glauca*.

Coccus. Antennæ filiform, of ten or eleven articulations in both sexes, shorter than the body; rostrum pectoral, conspicuous only in the females; males with two large incumbent wings; females apterous, subtomentose, fixed and becoming gall-shaped or shield-shaped after impregnation.

It is with a view to their importance as an article of commerce, arising from their use in the arts, that the insects of this genus are particularly interesting. When it is considered that the most brilliant dyes, and the most beautiful pigments, as well as the basis of the most useful kinds of cement, are their product, it will be acknowledged that to none of the insect tribe, except perhaps to the Bee and the Gall-insect, are we more indebted than to these singular and apparently insignificant little beings. Kermes, the scarlet grain of Poland, cochineal, lac-lake, lac-dye, and all the modifications of gum-lac, are either the perfect insects dried, or the secretions which they form.

Type of the genus, *C. Persicæ*, Fab.

Illustration: *Coccus cacti*.

APHIS. Antennæ setaceous, longer than the thorax, seven jointed; wings four, pellucid, longer than the body, the upper ones the largest; both males and females occasionally without wings, particularly the latter. Abdomen furnished near the base with two horns or tubercles.

The insects constituting this remarkable genus are well known under the name of Plant-lice. They infest almost every species of vegetable in innumerable quantities, occasioning the leaves to curl up, and often preventing the growth of the young shoots, by the punctures they make for the purpose of procuring the juices of the plant, on which they live. The injuries which these little insignificant animals sometimes occasion, are much more considerable than would at first be imagined, from their extreme tenuity, weakness, and inactivity; but their increase is so rapid and extensive, as to render them formidable enemies. The finest of our fruits are thus often nipped in the bud, or arrested in a subsequent period of their growth; and indeed scarcely any of our esculent vegetables are free from their attacks. The hop-grounds in Kent would, in some seasons, be rendered almost barren by their swarms, had not nature provided an efficient preventive. This consists in the circumstance of their forming the favourite food of the larva of the ladybird (*Coccinella*), and of several species of aphidivorous flies, particularly of the genus *Syrphus* of Fabricius. These larvæ fix themselves by the tail, in the midst of a host of aphides, and extend or contract themselves so as to reach their prey; and on seizing one, it is held up in the air, whilst all the juices of the body are sucked out, after which the skin is dropped.

The species are very numerous, and but imperfectly understood, but there is reason to believe, that very many plants nourish their own peculiar aphides; and it has been usual to name the species after the plants which they principally inhabit, as *Aphis Rosæ*, *A. Sambuci*, *A. Ulmi*, &c.

Illustration: *Aphis rosæ*.

ORDER VII.—DIPTERA. TWO-WINGED.

THE characteristics of the order *Diptera* may, in general terms, be thus stated:—Feet six; wings two, ribbed and extended; with two balancers placed behind them, in the place of the second pair; mouth consisting of from two to six scaly bristle or lancet-like pieces shut in a sheath; sheath, in the form of a trunk or syphon, bent or jointed, often ending in two lips, and generally furnished with a superior groove, and often provided with two maxillary palpi, which are sometimes enclosed in the sheath.

Several of the insects of this order, belonging to the genera *Tipula*, *Samulia*, *Tabanus*, and *Sternocorus*, incommode us and other animals with their suckers, which often perforate the skin and leave irritable wounds. Some, as the *Estri* or Gadflies, deposit their eggs in the bodies of domestic animals, and even sometimes in those of men themselves. Others, in the same manner, infest our meats, cheese, and eatables, or in the form of larvæ, attack plants, and make extensive ravages in them. But as a sort of compensation for these various injuries, these insects consume and destroy great quantities of putrid animal and vegetable substances, or dissipate the fetid and stagnant waters.

ILLUSTRATIVE EXAMPLES.

ECHINOMYIA. Antennæ with intermediate joint longer than the third; the lateral hair simple, and hid when the insect is at rest.

The *Echinomyia* resembles in form the common house Flies; but is remarkable for the large size of its body, which is covered with scattered long hairs, which are large, and, as it were, jointed at the base. The wings are spread, and the abdomen is broader than long. The manners of several of the species are comparatively well known: the perfect insects live but a very short time, and are found principally on the flowers of umbelliferous plants; the females lay their eggs in the Caterpillars (*larvæ*) and grubs (*pupæ*) of various *Lepidopterous* and some *Coleopterous* insects, which they eventually destroy.

Illustration: *Echinomyia fera*.

CEROPLATUS. Antennæ longer than the head, subfusiform, compressed, proboscis very short; palpi apparently without joints, very short.

These insects are remarkable for the form of their antennæ, which resembles a rasp or file. The abdomen is elongate and fusiform. The larvæ feed on mushrooms.

Type of the genus, also our—

Illustration: *Ceroplatus tipulois*.

THEREVA (of Latr.) Antennæ fusiform, or elongated into a conical form at the tips; palpi withdrawn into the oval cavity.

Type of the genus, *T. plebeia*.

Illustration: *Thereva crassipennis*.

TABANUS. Antennæ as long or longer than the head, three-jointed, the last joint awl-shaped and five-ringed; proboscis shorter than the head, and terminating in two large lips; haustellum consisting of six setæ; palpi nearly as long as the proboscis; head broad, transverse, sessile, in some species furnished with stemmata, as well as large brilliant reticulated eyes, but in others without stemmata; abdomen sessile, of same breadth as the thorax; wings horizontal and widely separate at their tips.

The *Tabani* very much resemble large flies, and are remarkable for their beautifully-coloured large eyes, which in the male are divided by a very narrow line in front, but in the female this line is much wider, and hence forms a good sexual distinction; their haustellum is furnished with six setæ, forming terrible instruments for puncturing the hides of cattle and horses, which they attack fiercely in spring and autumn, making wounds bigger than that of a large needle, from which the blood flows freely in large drops like tears. From the spreading of the lips of the proboscis the wound cannot be seen whilst the insect is at work, but the pain is very severe; and that produced by the Burning or Sand Fly of America and the West Indies, supposed to belong to this genus, is so great, that it has been compared to the pain which would be produced by a red-hot needle or by a spark of fire. It seems, however, that this sanguinary disposition belongs especially to the females, as the males are often noticed feeding on flowers. They seem to be spread generally over the globe.

Illustration: *Tabanus niger*.

DIOPSIS. Antennæ palette-shaped, each inserted on a prolongation of the side of the head into the form of a horn; the eyes situated at the end of these horns; trunk membranaceous, two-lipped, retractile.

This curious genus was first noticed by Fabricius.

Illustration: *Diopsis Ichneumonea*.

ORDER VIII.—APTERA. WINGLESS.

THIS is the Order *Suctoria* of *De Geer*; it includes one very well-known genus—the common Flea; distinguished from all other insects by its oral sucker, which consists of three pieces inclosed between the articulated plates, and forming a cylindrical or conical beak.

ILLUSTRATIVE EXAMPLES.

PULEX. Antennæ short, three-jointed, the two basal joints obconic, the terminal obtuse; palpi four-articulate, porrect; tongue slender, filiform, transparent; maxillæ lateral; head small; body compressed, apterous; legs long, formed for leaping; coxæ very much elongate and large; femora short; tibiæ pilose; tarsi five-jointed.

Type of the genus, *P. irritans* (the Common Flea).

There are nearly fifty species of this troublesome and active little insect.

Illustrations: *Pulex irritans*, *P. Chigoe*.

SECOND ARRANGEMENT OF INSECTS.

THIS second arrangement is in accordance with the systems of recent Naturalists. Only the principal genera illustrated in Plates III., IV., and V. are noticed.

ORDER I.—COLEOPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

PLATE 3.

ANTHIA. Corcelet, nearly heart-shaped; the head not narrowed behind; no obvious neck, palpi filiform, labrum oval, and projecting to the base of

the last articulation of its palpi. *Carabus 10-guttatus* of Linnæus belongs to this genus, and is the *Anthia decem-guttata* of Fabricius, &c.

Illustration: *Anthia quadriguttata*.

ELAPHRUS. Elytra entire, or not truncated behind; front pair of legs slightly nicked on the lower part of the inner side, with a linear slit; tongue prominent, membranaceous, or rather horny, divided into three lobes, the lateral of which are tooth-like, and the middle of the upper end of the middle lobe is nicked; jaws scarcely dilated externally; antennæ insensibly enlarging towards the end, formed of short obconical joints; eyes large and prominent.

Several species are found in Great Britain; they live on the banks of rivers and ponds, searching for small insects. Their larvæ and pupa are quite unknown.

Illustration: *Elaphrus uliginosus*.

OMOPHRON. Antennæ filiform, with the basal joint robust; palpi six, filiform, with the terminal joint nearly conic; mandibles horny, ciliated, and entire; head oval, deeply inserted into the thorax, which is very short, transverse, emarginate in front and lobate behind, the base nearly as broad as that of the elytra; the latter hard, entire, as long as the abdomen; legs slender, elongate; anterior tibiæ with a notch in front; tarsi pentamerous.

The species of this remarkable genus frequent damp, sandy places, but none of them have yet been detected in Britain.

Type of the genus, which is also our—

Illustration: *Omophron limbatum*.

NECROPHORUS. Antennæ rather longer than the head, slender at the base, and terminating suddenly in a large ovate perfoliate club, composed of four coarctate joints, the last of which is acuminate; head with a distinct neck; thorax suborbiculate, rounded behind, transversely-truncate anteriorly; elytra truncated in a straight line, with a marginal channel, not carinated; body oblong, much longer than broad; tibiæ short, robust; posterior trochanters sometimes with a spine at the apex; anterior tarsi dilated and furnished with long cilia in the males.

Seven of the twenty-seven species are found in England; they frequent carcasses, especially of the smaller mammalia, which they bury beneath the surface, and in them deposit their eggs, which become hatched in the putrid remains, and their larvæ reside in them until their period of change arrives, when they seek for a spot in which to become pupæ.

Type of the genus, *Silpha germanica*. Linnæus.

Illustration: *Necrophorus vespillo*.

TACHYS. Antennæ submoniliform, increasing in size towards their tip, and inserted before the eyes; mandibles simple; palpi in some filiform, in others awl-shaped; head deeply sunk in the thorax; body lengthy; elytra tolerably large; legs spiny.

Illustration: *Tachys minuta*.

DRILUS. Antennæ of twelve joints, longer than the head, and thorax pectinated on the inner side; maxillary palpi projecting forwards; thorax transverse, rather broader than the head; body depressed, rather long; head truncated; mandibles one-toothed, thin, horny; jaws simple, or at least destitute of any internal appendix, supporting two club-shaped palpi; lower lip rounded, wings membranaceous, plaited; tarsi all five-jointed, the last joint heart-shaped.

These insects fly with facility, and are found on flowers, especially on those of trees. They are parasitical on the common Snail.

Illustration: *Drylus flavescens* (of Olivier), common in England and the south of Europe.

TILLUS. Antennæ filiform, as long as the thorax, increasing in thickness towards the tip, and toothed on the edge like a saw; mandibles slightly double-toothed; maxillary palpi filiform, last joint of the labial large and hatchet-shaped; body lengthy and roundish; thorax narrower than the wing-cases; tarsi five-jointed.

This insect is not carnivorous, but frequents plants and flowers, upon the juices of which it feeds. Two species are described, both European.

Illustration: *Tillus mutilarius*.

ULEIOTA. Antennæ filiform, at least as long as the body, with lengthy

cylindrical joints; upper lip projecting between the mandibles; last joint of the palpi sharpish at the tip; body oblong, much depressed; tarsi short. These insects live beneath the bark of trees. The type of the genus is *Cerambyx planatus*. Linnæus.

Illustration: *Uleiota flavipes*.

MOLORCHUS. Antennæ setaceous, nearly as long, or longer than the body, basal joint stout, second minute, the remainder long, cylindric, a little elevate; labrum minute, pilose, heart-shaped; maxillary palpi quadriarticulate, the three basal joints small, the terminal one ovoid, compressed, truncate; labial triarticulate, the two basal joints short, terminal longer, ovate-truncate; elytra abbreviated, gaping at the apex; wings exposed; legs unequal, anterior shortest, posterior longest; femora very much clavate; tarsi four-jointed.

There are nine species, found in flowers, especially of the umbelliferous kind; two of them occur in Britain.

Illustration: *Molorchus abbreviatus*.

RHAGIUM. Antennæ setaceous, shorter than the body, the basal joint stout, second small, somewhat nodose, third longer than the fourth, which is shorter than the fifth, the latter being longer than the third, the remaining joints of nearly equal length, about as long as the fourth; palpi four, with the terminal joint thickened, short, obconic, truncate; labium with divaricating, slender laciniae; head large, with a tumour behind the eyes, the latter rounded; thorax constricted within the base and apex, the lateral margins with an acute spine; elytra broad, with the shoulders considerably elevated; legs moderate; femora rather stout; tarsi tetramerous.

About twenty species, of which three are occasionally found in England, frequenting the old stumps of decayed trees.

Illustration: *Rhagium mordax*.

CEROCOMA. Antennæ club-shaped, or increasing considerably towards the extremity; of nine articulations, the last very large; elytra horizontal.

These insects are remarkable for the great brilliancy of their colours. They make their appearance towards the middle of summer, and principally frequent radiated flowers, as the *Camomile chrysanthemum*, &c. They fly easily, but walk little; and on being taken, like many other *Coleoptera*, counterfeit death.

Type of the genus, our—

Illustration: *Cerocoma Schoefferi*.

NOTOXUS. Antennæ subfiliform, inserted before the eyes, simple, eleven-jointed, the articulations a little obconic, the second smallest, the remainder somewhat equal, the last oval; mandibles slightly curved, acute, cleft at the apex; palpi with the terminal joint securiform; body oblong; head natant, united by a slender neck to the thorax, the latter heart-shaped, narrowed and truncate posteriorly, with the anterior edge prolonged into a point in form of a horn projecting over the head; scutellum minute; legs rather long; tibiæ very short; tarsi heteromerous.

Type of the genus, which is also our—

Illustration: *Notoxus monocerus*.

LOMECHUSA. Antennæ forming a perfoliate or fusiform club, often shorter than the head and thorax; the palpi ending in an awl-shaped joint; head sunk into the thorax to the eyes; legs not spinose.

The type of the genus is *L. paradoxa*.

Illustration: *Lomechusa dentata*.

PLATE 4.

COLEOPTEROUS INSECTS—(continued.)

ELOPHORUS. Mandibles not toothed at the end; maxillary palpi rather shorter than the antennæ; the last joint broad, oval, the club of the antennæ commencing with the sixteenth joint. All the species are small insects living in water, and swimming on its surface, and living upon duck-meat, conferva, and other aquatic plants.

Illustration: *Elophorus aquaticus*.

SCAPHIDIUM. Antennæ longer than the thorax, slender at the base, with an abrupt elongate club, composed of five somewhat hemispheric, nearly equal joints, the terminal one rounded at the tip; palpi four, filiform; head produced in front; thorax ample, margined on the sides; body robust,

accuminated at each extremity; elytra margined, truncate; scutellum distinct; legs slender, elongate; tibiae smooth.

Type of the genus, also our—

Illustration: *Scaphidium quadrimaculatum*.

NECRODES. Antennae distinctly longer than the head, rather slender, terminating gradually in an elongate, perfoliate club, composed of three joints, the terminal ones obtuse; head oblong with a distinct neck; eyes large, prominent; thorax orbicular, with a narrow border; elytra obliquely truncate at the apex, tricarinated; body elongate-oval, scarcely longer than the elytra; legs elongate; tibiae channeled, slightly spinous; posterior femora of the males more or less thickened and clavate, sometimes denticulated; anterior tarsi in the males more or less denticulated.

Two species, found in dead carcasses of dogs, &c., chiefly in damp places; one of them inhabits Britain.

Type of the genus, which is also our—

Illustration: *Necrodes* (vel *Silpha*) *littoralis*.

NITIDULA. Antennae very short, the basal joint orbicular, dilated, the third longer than the fourth, the apex terminating in a large, abrupt, broad, coarctate, perfoliated, three-jointed club; palpi nearly equal, short, filiform; head small, inserted up to the eyes in the thorax, the latter more or less emarginate on its anterior edge, the sides depressed, deeply margined; elytra broad, entire, rarely truncate, subovate, glabrous, deeply margined, and in general connecting the extremity of the abdomen; body ovate, or elliptic, broad, obtuse, somewhat depressed; legs short; tibiae broad, the anterior elongate-triangular; tarsi pentamerous, with the third joint dilated and bifid, the following minute, indistinct.

The type of the genus is shown in our—

Illustration: *Nitidula grisea*.

ORDER II.—ORTHOPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

TRIDACTYLUS. Antennae short, submoniliform, ten-jointed; eyes very distinct; thorax wider than its length; anus furnished with four styliform appendages; anterior two pairs of legs broad, the first pair spiny at the top and grooved to receive the tarsus when folded; posterior legs having large lengthy thighs, and slender, long shanks, covered externally with little scales, and having, instead of tarsi, little moveable, narrow, hooked plates, resembling fingers, varying from three to five in number; when the latter, the middle three are the longest.

This genus very nearly resembles the Mole-cricket, *Gryllotalpæ*, but are distinguished by the form of the antennae and of the legs. They live in the mud on the banks of rivers. Two species are described, both European, of which our—

Illustration: *Tridactylus paradoxus* is the type.

TRUXALIS. Antennae short, compressed, sword-shaped, joints indistinct, attached above the line separating the eye; head pyramidal with two lengthened eyes, and three small smooth ones; mouth at bottom of the head, lower lip bifid; body lengthy; abdomen simple, covered by the wing-cases as with a roof; hind legs much longer than the body, and fit for leaping.

All the species of this genus (which belongs to the Cricket family) are natives of warm countries.

Illustration: *Truxalis nasuta*.

ACRYDIUM. Same as *GRYLLUS*, p. 139.

ORDER III.—NEUROPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

RAPHIDIA. Antennae inserted between the eyes, remote, as long as the thorax, filiform, consisting of nearly forty very short cylindric articulations, the two basal ones being largest; head obovate, elongate, attenuated behind; somewhat vertically inflexed, abruptly narrowed at the base, which

resembles a collar; thorax with its anterior segment or prothorax very much elongated, slender, nearly cylindric, being a little narrowed in front; second segment, or mesothorax, much broader and shorter; wings four, equal, reticulated, deflexed; abdomen elongate, compressed, soft; apex produced, in the male into two strong claws, in the female with a linear, straight, compressed, slightly reflexed, acute ovipositor; legs slender; tibiae cylindric, with minute spurs.

Type of the genus, *R. ophiopsis*, Linnæus. Several species; of which about seven inhabit Britain.

Illustration: *Rhaphidia notata*.

EPHEMERA. Antennae very short, ending in a bristle; upper lip covering the mouth; mandibles none, or very small; palpi very short, scarcely distinct; tarsi of five joints.

The Ephemera are named on account of their exceeding short lives.

The perfect insects live only a few hours, for the purpose of perpetuating their species, and then die. The larvæ are longer lived, and when the insect has gained all its parts, it undergoes another change of skin.

The type of the genus is the—

Illustration: *Ephemera vulgata*.

PANORPA. Antennae setaceous, inserted between the eyes; ocelli three, disposed in a triangle on the front, the two hinder ones largest; head vertical, produced anteriorly into a perpendicular rostriform plate, receiving the oral organs; palpi subequal, filiform; thorax with the anterior segment very short, the second longer; wings reticulated, equal, horizontal, ovate-elliptic, placed one over the other during repose; body elongate, narrow; abdomen of the male furnished with a forcipated process; legs elongate; tibiae with short spurs; tarsi with two bent claws, toothed within.

Type of the genus, and—

Illustration: *Panorpa vulgaris*.

ORDER IV.—TRICHOPTEROUS INSECTS.

THIS order was formed by Kirby and Spence, from the order Neuroptera; and so named because of the hairy covering with which their wings and bodies are beset. They have the appearance of small Phalænæ.

Antennae inserted between the eyes, long, composed of numerous joints; head small, transverse, vertical; ocelli two; eyes prominent; mandibles wanting; palpi four, maxillary longest; wings ample, deflexed, pilose, inferior folded; legs elongate, spinose; tarsi pentamerous, cylindric.

Illustration: *Limnephilus griseus*.

ORDER V.—HYMENOPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

BANCHUS, a genus of the family Entomotilæ; the family characteristics of which are: abdomen pedicelled, not concave beneath; lower lip as long as the jaws; antennae not bent, of seventeen to twenty joints. This family contains, according to Dumeril, the genera *Ichneumon*, *Fanea*, *Evania*, *Ophion*, *Banchus*. It forms part of the family *Ichneumonidæ*.

The antennae of the genus *Banchus* are filiform or setaceous, and the abdomen is gradually narrowed to the tip.

One common British species is our—

Illustration: *Banchus pictus*.

EVANIA. Antennae filiform, revolute, of twelve or thirteen joints, toothed on the inner side; maxillary palpi very long, of six unequal joints; the labial palpi four; the lower lip with four divisions, the centre one of which is deeply cut, its sheath broad, dilated on the sides; head rather flattened, narrower than the thorax; eyes oval; thorax broad, convex, nearly cubical; upper wings with one radial, and mostly two cubital cells, of which the first is nearly square, and receives the recurrent nerve; the second recurrent nerve deficient; abdomen very small, triangular, or oval, compressed, joined to the thorax by a long, thin, arched pedicle, inserted on the upper part of the thorax.

These insects are small, and very remarkable for the shortness of their

abdomen. There have been only a few species described, of which the following is the type—

Illustration: *Evania appendigaster*

SCOLIA. Antennæ filiform, thick, straight, inserted rather below the middle of the face, thirteen-jointed, and somewhat elongated in the males; fourteen-jointed in the females; mandibles stout; palpi short, filiform, maxillary six-jointed, labial four-jointed; eyes emarginate; wings four, anterior with three submarginal areolets, with two perfect discoidal ones, and an open one towards the apex; the second submarginal areolet receiving a recurrent nervure; abdomen elongate, slightly pedunculated; legs robust; femora compressed; tibiæ robust, four posterior with acute spurs at the apex, tarsi downy.

Type of the genus, *S. hortorum*. A very numerous genus. None of them occur in Britain.

Illustration: *Scolia quadrimaculata*.

MUTILLA. Antennæ longer than the head, filiform, situated in the front of the head, the first and second joints elongate; maxillary palpi longer than the maxillæ; head large; abdomen oval in both sexes, convex, the second segment large; thorax cubical; wings with one marginal and three submarginal areolets; wanting in the females.

Inhabitants of warm and temperate regions.

Illustration: *Mutilla coccinea*.

ICHNEUMON. Maxillary palpi of five joints, mouth not produced into a beak, joints of the maxillary palpi unequal; antennæ filiform or setaceous; jaws two-toothed at the top; ovipositor hidden or slightly produced; abdomen oval or depressed, formed of five, or more, apparent rings.

The type of the genus is *I. sagittatorius* of Fabricius.

The Ichneumons are more formidable to the larvæ of insects than the Ichneumon of the ancients, which was said to enter the Crocodile's mouth while it was asleep and eat out its intestines; for the Crocodile could prevent its entrance by keeping its mouth shut, but the larvæ of insects can use no such precaution, and it is almost impossible for them to escape entirely. The female Ichneumon of those species is provided with a long ovipositor, which it introduces, when about to lay its eggs, in a perpendicular direction into every hole which is likely to contain one of its victims. They generally choose those larvæ which are about to change into their pupa state. The larvæ of the Ichneumons are small worms, destitute of legs, which live in the bodies of other larvæ as intestinal worms do in the bodies of larger animals. Others lay their eggs in the galls produced by the *Tenthredo*s. De Geer described a species which deposits its eggs in the bodies of spiders; and he also observes, that the Plant Lice are also subject to the attacks of several species of this family.

Illustration: *Ichneumon manifestor*.

MASARIS. Antennæ compressed, eight-jointed, the terminal joint thickened, obconic, in the male as long as the head and thorax united; abdomen considerably elongated; thorax, with the first segment, prolonged to the base of the superior wings, which are longitudinally folded; lip long, filiform, tubulose, with two elongated linear laciniae beneath.

Type: *M. vespiformis*, a native of Barbary, found on flowers.

Illustration: *Masaris apiformis*.

ORDER VI.—LEPIDOPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

PLATE 5.

CRAMBUS. Tongue distinct; the four palpi conspicuous; inferior ones large; wings incumbent, giving a cylindrical appearance to the insect.

Type: *C. carneus*, Fabr.

Illustration: *Crambus margaritellus*.

ADELA. A genus of the section Tineites, the characters of which are: antennæ setaceous, simple, sometimes ciliated, and far apart at their insertion; palpi apparent; trunk indistinct; upon the clypeus a tuft of erect little scales; wings long, inclosing the body. Larva six-footed, solitary, and inclosing itself in a proper sheath.

Most of the insects of this section are very easily distinguished from the *Phalænæ*, by their peculiar appearance and form; they are the smallest, most brilliant, and most richly ornamented of all the *Lepidoptera*, gold and silver mingled with the brightest colours overspreading the wings of a great number.

The species of *Adela* have very long antennæ, with the eyes contiguous; palpi very small and pilose; wings brilliant. They are found in wood, and are called *Japan Moths*.

Illustration: *Adela sultzella*.

ORDER VII.—DIPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

CERIA. Antennæ considerably longer than the head, the second articulation, with the terminal, forming an oval club, terminated with a very short conical style.

Type: *C. clavicornis*, Fabr.

Illustration: *Cerai conopsoides*.

HENOPS (*Ogcodes* of Latreille). Antennæ very minute, biarticulate, inserted in the superior margin of the mouth; head almost wholly occupied by the eyes; ocelli three; proboscis concealed; thorax convex; abdomen robust, gibbous; legs simple; onychii three.

Type of the genus: *Musca gibbosa*, Linnæus. Three species of this singular genus only are known, two of which inhabit England.

Illustration: *Henops marginatus*.

ANTHRAX. Palpi received into the cavity of the mouth; proboscis short, scarcely projected.

Illustration: *Anthrax moria*.

ORDER VIII.—HEMIPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

TINGIS. Antennæ filiform, four-jointed, the third joint very long, and the fourth large and oval; trunk ensheathed at its base, with the edges of the sheath much raised; body flat and membranous; wing-cases much reticulated, wide, and covering the sides of the abdomen.

This genus, formed by Fabricius, is very remarkable for the semi-transparency of its thorax and wing-cases. They are natives of Europe.

The type of the genus is *T. Cristata*, Panz.

Illustration: *Tingis vinarum*.

LYGÆUS. Ocelli two, very far from each other; antennæ always filiform, inserted on the side of the head, just above the beak; head not narrowed behind, so as to form a neck narrower than the thorax; thorax trapezoidal.

There are many species of the genus found in England.

The type is *L. equestris*, the *Cimex equestris* of Linnæus.

Illustration: *Lygæus militaris*.

HYDROMETRA. Antennæ bristle-like, with the third joints much longer than the others; the front legs not folded; head cylindrical; trunk produced, in an inferior groove.

The type of the genus common in stagnant pools, is our—

Illustration: *Hydrometra stagnarum*.

GERRIS. The four hinder legs inserted on the side of the thorax, far distant at their origin, long, slender, with the two hooks of the end of the tarsi very small, and placed in a lateral slit; the second pair distant from the first, which are very small, and serve the purpose of claws; the antennæ filiform, sheath of the sucker of three valves.

These insects are of a blackish colour, and run with great quickness on the surface of water, on which they move as if by jumps; beneath they are silvery-white. They are usually apterous, and they reproduce their species in that state; indeed, they only appear, like the Bed Bug, to gain their wings under peculiar circumstances.

The type of the genus is our—

Illustration: *Gerris lacustris*.

ORDER IX.—HOMOPTEROUS INSECTS.

ILLUSTRATIVE EXAMPLES.

LYSTRA. Head transverse, and not prolonged into a horn; body long; elytra not enlarged behind as in the genus *Flatta*, nor narrowed into a point as in *Icyus*.

The type, *L. lunata*, Fabricius, is found in South America.

Illustration: *Lystra lanuginosa*.

FLATA. Antennæ with three distinct joints, the second the largest, cylindrical, ovoid or nearly globular, inserted immediately under the eyes; head generally transverse, and not prolonged, or at least only forming a blunt point; ocelli two; wings very broad, and the elytra applied one against the other by their hinder edge.

The females envelope their eggs within a white cottony substance, which is placed at the end of the abdomen.

The genus has been divided into two sections, according to the colour of their wings:—I. Wings variegated with colours, and II. Wings transparent.

Illustration: *Flata alba*.

DELPHAX. Antennæ inserted in a niche under the eyes, a little longer than the head, the first joint shorter than the second.

The wings of this genus are usually very short; and the habits of the species are most probably very similar to the other *Cicada*.

Illustrations: *Delphax pellucidus*, *D. dorsatus*.

THRIPS. Antennæ filiform, almost setaceous, eight-jointed, nearly as long as the head and thorax; beak very small, scarcely apparent, consisting of a sheath, formed by a pair of three-jointed valves, between which is the sucker, with a pair of very short filiform, three-jointed palpi; body lengthy, terminating behind in a kind of tail; wing-cases and wings nearly similar, linear, horizontal, and ciliated on their edges; tarsi very short, two-jointed, of which the second is vesicular, and not armed with clawlets.

These insects are the smallest of the Aphidian family, and some are scarcely visible. They are natives of Europe, and live upon flowers and the bark of plants.

Illustration: *Thrips cæruleocollis*.

ORDER X.—STREPSITEROUS INSECTS.

THE Strepsiterous, or Twisted-winged, Order of insects was established by Kirby, and consisted of the genera *Stylops* and *Xenos*. In these genera the soft coriaceous elytra are placed very near the head, not on the back, however, but attached to the coxæ of the anterior pair of legs; they are widely separate from each other, and never come in contact, but recede from the body, then curve towards, and a second time diverge from it. Lamarck and Latreille, however, deny that the elytra, so called by Kirby, are other than scales, because elytra never have such attachment, which remarkable variation is the precise reason why Kirby forms his new Order. Lamarck, however, does not consider them entitled to the rank of a distinct Order, but makes them a section of his *Dipterous* Order.

ILLUSTRATIVE EXAMPLES.

STYLOPS. Antennæ biarticulate at the base, and sending out two branches, long, compressed, unequal, of which the upper is triarticulate.

This genus is distinguished from *Xenos* by the unequal length of the antennæ, and by the jointing of the upper one.

Illustrations: *Stylops melita*, *S. Kirbyi*, *S. Dalii*.

XENOS. Antennæ three-jointed at the base, and thence cleft to their tip into two branches of equal length, slender, semicylindrical, and jointless; eyes pedunculate and cellulous; abdomen projecting, horny, with a fleshy vent.

This curious genus, of which the larva is parasitic, and lives in the belly of the Wasps called *Polystes*, was discovered by Rossi in the French species, and subsequently by Peck, in *P. Fuscata*, an American Wasp, who says, that the abdomen of such Wasps is so distorted by this larva, that he had no difficulty in knowing them when on the wing. Rossi observes that it is the fourth abdominal segment from which the *Xenos* in its pupa state usually emerges—sometimes one, often two, and occasionally three, from the same Wasp; it emerges in its imago state in the month of August or in September.

Illustration: *Xenos vesparum*.

CLASS VII.—CRUSTACEA.

THE covering of this Class of Articulated Animals is less solid than the envelopes of the majority of Testaceous Molluscs; but their skin is much tougher than the skin of the Naked Molluscs. In their respiratory, circulating, and locomotive organs they are distinguished from three other Classes. In the arrangement of this Class, almost every writer of note has adopted views distinct from the others; hence the great dissimilarity of classification which exist in the several works published on those interesting animals. In March, 1830, Milne Edwards read before the Royal Academy of Sciences a paper, in which the construction of the oral organs is made the foundation of their division into two sections: the *first* including those of which the mouth is not furnished with any special organs of mastication; and the *second* composed of such as have proper masticating organs, viz., a pair of mandibles and one or more pairs of maxillaries or jaws. Subsequently, however, in his excellent work, *Histoire Naturelle des Crustacés*, 1834, Edwards found it necessary to form a third section for the Xyphosurian Crustaceans, which he had previously included in his first section, to which they had little resemblance, and indeed are more nearly allied to the second, although sufficiently distinct from it also to justify their formation into a distinct section. He therefore arranges the Crustaceans in the three Classes: 1. Suckers; 2. Xyphosures; 3. Masticators; and these, with the exception of the second, he divides into several Orders: the Class Suckers, including the *Arane form*, *Lern form*, and *Syphonostemous* Orders, and the Class Masticators, comprising the *Entomostracous*, *Branchiopodous*, *Trilobites* (fossil), and *Edriopthalmous* legions, with their several Orders, all of which are devoid of true branchiæ or gills, together with the *Podopthalmous* legion, and its Orders, which have perfect branchiæ, and are the most highly developed of the whole Class.

IN Milne Edwards' classification of the Crustacean families, we find placed in his PODOPTHALMOUS legion the *short-tails* (Brachyura), the *long-tails* (Macroura), and the *footed-mouths* (Stomapoda); his EDRIOPHTHALMOUS legions contain, among others, those with *equal legs* (Isopoda); and his BRACHIOPODA are crustaceans destitute of true branchiæ, but having their thoracic extremities so formed as to serve the purposes of respiration.

The first Order of Crustaceans, according to Latreille, is the *Decapoda*, the situation of whose gills, and the number of legs, form their essential character.

This Order is formed of the genus *Cancer* of Linnæus, excepting some species with naked gills, and of the classes *Kleistagnatha* and *Exoethnatha* of Fabricius, adding the genera *Limulus*, *Squilla*, and *Gammarus*; and it is

the *Malacostraca podopthalma* of Dr. Leach. They are the animals which the ancients particularly noticed under the name of *Crustacea*, or *Crustata*.

Their bodies are usually more or less covered with a kind of shield or shell formed of a single piece, and guarded below with a kind of breast-plate (or *plastron*), divided transversely into segments, each carrying a pair of true or jaw-like legs. The hinder part of the body, which Latreille calls the post-abdomen, or *Urogaster*, but which is usually though erroneously called the tail, is only an extension of the end of the alimentary canal, which is defended by seven rings, which are hard above, and soft and membranaceous below, and carry on their lower part the false legs.

Latreille divided this Order into two sections according to their general form:—1. *Brachyura* or *Crabs*; and, 2. *Macroura* or *Lobsters*.

ORDER I.—BRACHYURA. SHORT-TAILS.

TAIL short, applied to the chest; destitute of terminal fins, or fin-like expansions; gills solitary; the external aperture of the female organs of generation between the third pair of legs.

ILLUSTRATIVE EXAMPLE.

PLATE.

GRAPSUS. Antennæ four, short, jointed, hid under the hood; eyes at the angle of the hood, and shortly pedicelled; body depressed, nearly square; fins clawed; the two anterior legs ending in pincers.

The species of this genus, which are found in the West Indies, being very finely coloured, are called the Painted Crabs. They live principally on putrid animal substances.

The type of the genus is our first—

Illustration: *Cancer pictus*.

ORDER II.—MACROURA. LONG-TAILS.

TAIL as long or longer than the thorax, incurved and furnished with two little fins on the sides of the end of the tail; gills united at their base; vulva on the first joint of the third pair of feet.

ILLUSTRATIVE EXAMPLE.

PAGURUS. Antennæ four, interior bifid at the apex, peduncle of the interior longer than the setæ, which are articulated; legs dissimilar, formed for walking, anterior didactyle, furnished with a finger and thumb; tarsi of all conic; tail soft, furnished with hooks at the tip.

All the animals of this genus are parasitical, inhabiting the empty cavities of turbinated shells; they change their habitation with their growth, and are called Soldier-crabs and Hermit-crabs.

Type of the genus, also our—

Illustration: *Pagurus* (vel *Cancer*) *Bernardos*.

ORDER III.—STOMAPODA. FOOTED-MOUTHS.

THESE have naked branchiæ which adhere to the five pairs of appendages, or fin-feet, attached beneath the abdomen; the four fore-legs approach close to the mouth, whence the name by which they are designated.

ILLUSTRATIVE EXAMPLE.

SQUILLA. This genus belongs to the *Unipeltate* family of the *Stomapodous* Order of the *Malacostracous Crustaceans* of Latreille and Edwards, and is probably one of the most, if not the most, voracious of the class, as indicated by its strong offensive weapons, the claw terminating its prehensile legs being sickle-shaped, and armed with long teeth on one of its pieces, which is received into a corresponding groove on the other. The dorsal shell, of a squarish shape, is divided into three lobes, with a moveable triangular plate on its anterior edge, but posteriorly it does not cover the three pair of ambulatory thoracic legs, which therefore do not seem to belong to it. The branchiæ are placed along the lower edge of the body. The body is generally of a more elegant form, and more slender behind the dorsal shell than in the other genera of the same tribe; the tail is large, and long,

composed of six segments, the last of which bears some appendages which spread out in a fan-like shape. Their false abdominal legs are in constant motion, and they swim with great speed, impelling themselves by their powerful tail. Lamarck enumerates seven species, of which our—

Illustration: *Squilla mantis*

is the type. Edwards names as many as sixteen, which he divides into two sections.

ORDER IV.—ISOPODA. EQUAL-LEGS.

THESE Crustaceans are known as the *Polygonata* of Fabricius. They have fourteen well-developed abdominal extremities, none of which are attached to the head but to a distinct segment; they are hooked at the tip and are destitute of any vesicular appendage at the base; the five first pairs are lamellar, and subserve the purposes of respiration.

ILLUSTRATIVE EXAMPLES.

CYMODOCE. A form of the *Sphæromides*, whose generic characters are:—Antennæ four, small, and unequal, of which the outer two are rather longest; two sessile eyes; body oblong, convex, with subimbricated transverse sections, and contracting into a ball; tail with two segments, the last furnished with a pair of natatory scales attached to a single pedicle; legs fourteen.

In the Cymodocean Isopods, the leaflets of the fins are projecting and directed backwards; the sixth segment is not prolonged posteriorly, and in a notch in the last segment there is placed a small blade.

Illustration: *Cymodoce Lamarckii*.

PORCELLUS. Antennæ four, joints in the two lateral, which are setaceous—seven, in the intermediate, which are very small—two; tail composed of six segments, and having four appendages, the two external being larger than the two internal ones. They are distinguished from the true Woodlice (*Oniscus*), by having seven joints in their antennæ, in the latter the number being eight.

Illustration: *Porcellus asellus*.

ORDER V.—BRANCHIOPODA. FOOTED-GILLS.

THESE Crustacea are for the most part microscopical. Their extremities are lamellar, and membranous; mouth composed of an upper lip, two mandibles, a tongue and maxillæ—in some one in some two. Their legs, in general, are fitted for swimming.

ILLUSTRATIVE EXAMPLES.

POLYPHEMUS. Body short, globular, inclosed in a bivalve shell; head divided from the body by a strangulation; one eye, with two short, inarticulated cirri beneath; antennæ large, resembling arms; tail slender, elevated over the back, and bifurcated; legs eight.

Illustration: *Polyphemus stagnalis*.

Common in ponds and marshes in Europe.

DAPHNIA. Shell bivalve; head apparently armed with two antennæ; legs eight or ten; eyes solitary; tail distinct. The most interesting species, and that which is considered the type of the genus, is shown in our—

Illustration: *Daphnia pulex* (of Müller).

Found very commonly in ditches and stagnant waters.

BRANCHIPUS. Antennæ setaceous, two or four; eyes two, pediculate, compound, moveable; two moveable horns situated on the front, having a single tooth on the outer side, forked at the apex; head distinct from the body, which is soft, transparent, elongate, divided into eleven segments; tail long, sub-cylindrical, articulated, diminishing gradually, and terminated by two ciliated fins; feet formed for swimming, ciliated, in number eleven pairs.

The animals of this genus are very remarkable for many peculiarities in their form and character. Unlike the *Crustacea* generally, they have no shell. It appears that they undergo considerable changes of form, in their successive stages of development. They are found in stagnant waters.

The type of the genus is shown in our—

Illustration: *Branchipus* (vel *Cancer*) *stagnalis*.

CLASS VIII.—ARACHNIDA.

THE trunk or body of this Class, differing as to the solidity of its external covering in its several Orders, consists either of two distinct though connected regions, or is but one undivided whole. In the former case, the anterior region includes the head and thorax undistinguished from each other by definite boundary, and therefore called the cephalo-thorax, whilst the posterior region is the abdomen.

ILLUSTRATIVE EXAMPLES.

PLATE—ARACHNIDA.

ORDER I.—THYSANOURA. FRINGED-TAILS.

FORBICINIA (of Geoffrey), or **LEPISMA** (of Linnæus). Eyes small, far apart, composed of granulations; body flattened, and ending in threads of the same length, inserted on the same line, and not raised in leaping. Body long, and covered with bright, silvery scales, which are longitudinally striated; they have lately been used as a test for the goodness of microscopes.

Type of the genus, *L. Saccharina*, found in damp places.

Illustration: *Forbicina vittata*.

PODURA. Antennæ short, straight, four-jointed; palpi inconspicuous; body apterous, cylindric; abdomen elongate, linear; tail furcate, inflexed beneath the abdomen.

Type of the genus, *P. plumbea*, found with the other species, which are extensive in damp places, beneath stones.

Illustration: *Podura villosa*.

Our Plate contains figures of two species of the most common genera of *Parasites*—human and ornithological:—

RICINUS (*Nirnidia* of Leech). Antennæ five-jointed, filiform; body narrow; head of moderate size, with the sides rounded, or unangular anteriorly; abdomen with the last segment entire and rounded in the males; tarsi curved, triarticulate, with two contiguous, parallel, bent claws.

Type of the genus, *N. discocephalus*, Nitzsch. A numerous genus living upon birds of all orders; about fourteen species have been detected in Britain.

Illustration: *Ricinus pavonis*.

PEDICULUS. Apterous; antennæ short; mouth produced into a very short, tubular haustellum; thorax distinct, not narrower than the abdomen, which is linear; tarsi didactylous. Of this unsightly genus two species are found in Britain.

Type of the genus, and—

Illustration: *Pediculus humanus*.

ORDER II.—ARANEIDA. SPIDERS.

ILLUSTRATIVE EXAMPLES.

MYGALE. Palpi projecting, pediform, inserted at the extremity of the jaws; mandibles robust, with their points bent downwards; jaws two, elongated; labium small, quadrate; eyes eight; body large; legs long, stout.

The species are of large size, but not very numerous; they build their nests of silky tubes or bags in holes in the ground, or in trees. The *type* devours ants, and sometimes, it is affirmed, small birds; the latter inhabits South America.

Type of the genus, and—

Illustration: *Mygale avicularia*.

ARANEA. Eyes eight, disposed in two transverse lines near each other, and bent somewhat backwards. Maxillæ straight, longitudinal, of equal breadth, apex rounded, inner angle truncated. Lip nearly quadrate, of about equal length and breadth, becoming gradually a little narrower towards the superior angles. The fourth and first pairs of feet of nearly equal length, and longer than the second.

The habits of the different species of Spiders are, perhaps, as interesting as those of almost any other tribe of animals; and the ingenuity with which some of them form their beautiful geometrical web, has in all ages excited the admiration of the most casual observers of nature, and supplied allusions and illustrations to the moralist and the poet.

Illustrations: *Aranea extensa*, *A. lobata*.

ORDER III.—CHELIFERA. SCORPIONS.

ILLUSTRATIVE EXAMPLES.

SCORPIO. Head, thorax, and abdomen united, forming an elongate-ovate mass; mandibles short, rounded, narrow, hirsute; legs twelve, anterior pair extremely short, second pair much elongated, the last joint, thickened at its apex, armed with forceps, the remaining four pair formed for walking, and resembling each other; eyes six or eight, two large approximating ones on the disc of the thorax behind, and two or three small contiguous ones on each side of the anterior lateral margin; breast with two pectinated plates; tail six-jointed, the terminal joint armed with an elongate, curved spine, perforated near the apex for the passage of poison.

Type of the genus, *S. Europæus*, Scopoli. A numerous and disgusting tribe of animals, very abundant in the hotter regions of the globe, though in very warm summers individuals have been found in the ports of England.

Illustration: *Scorpio rufescens*.

CHELIFER. Mandibulæ short, apex didactylate; palpi two, very long, of five articulations, broken, having pincers at the apex; maxillæ two, connivent; eyes two or four, inserted at the sides of the thorax; body ovate, rather acute before, depressed; the abdomen ringed; feet eight, the tarsi with two claws.

These little animals, which in form somewhat resemble a minute scorpion without a tail, are found under stones, the bark of trees, &c., or in houses amongst old papers or in holes in walls. They feed on the carcasses of insects, or on any dried animal substances, and occasionally on Woodlice or Flies, on which they are parasitic.

Type of the genus, and—

Illustration: *Chelifer cancroides*.

ORDER IV.—ACARIDA. MITES.

ILLUSTRATIVE EXAMPLES.

SMARIS. Palpi small, filiform, straight, simple; mouth porrect, elongated into a beak; eyes two; body oval, scaly; legs not formed for swimming, eight in number, the anterior pair longest, four posterior somewhat remote.

The type of the genus, *S. Sambuci*, inhabits various parts of Europe, and is taken occasionally in England.

Illustration: *Smaridia fringillaris*.

SIRO. Body oval; palpi two, five-jointed, the joints elongate; mandibles two-jointed, cylindrical, compressed, and forcipate; eyes two, placed on a peduncle on each side of the thorax; legs eight, elongate, filiform; tibiae and tarsi two-jointed, terminated with a bent claw.

Found in France and England, at the roots of trees, beneath mosses.

Type of the genus, and—

Illustration: *Siro rubens*.

CLASS IX.—MYRIAPODA.

THESE Animals are immediately distinguished from the Annelids by the presence of jointed legs, of which the number is so great that they are commonly known as Centipedes or Millipedes.

MYRIAPODS are divided into two Orders, viz., SCOLOPENDRÆ and CHILognathous. Of the former, *Lithobius* is a representative; and of the latter, *Polydesmus*, *Glomeris*, and *Julus* (proper), are presented as examples.

The rings which envelope their body are horny and more or less hard; are imbricated or slightly overlapping each other, and are either entire and cylindrical, as in *Julus*, or consisting of two semicircular pieces united by



Julus.

membrane, and depressed, as in *Scolopendra*. The number of rings varies, increasing with the age of the animal, but in the *Scolopendra* it ranges between fifteen and twenty-one. Neither ring is furnished with more than a single pair of *stigmata*, or orifices of air-vessels, and sometimes only the alternate rings are so furnished, as in *Scolopendra*. The row of pores on either side



Scolopendra.

of the body are for the secretion and discharge of an acrid and fetid fluid, which serves as a sort of defence. The rings exhibit scarcely any difference between each other excepting the head or skull, which upon its upper surface presents only a shield-like disc, supports the eyes and the antennæ, and overhanging the parts composing the mouth, which consists, according to Savigny, of a broad upper lip, of a pair of mandibles, a lower lip formed by the junction of a pair of primary, and another of secondary maxillæ; hence the term *Chilognathous*, or lip-jawed Order, applied by Latreille to the *Juli* and their congeners.

ILLUSTRATIVE EXAMPLES.

POLYDESMUS. Antennæ seven-jointed, filiform; the second joint much shorter than the third; body very long, linear; segments laterally com-

pressed and margined; legs numerous, each segment having two pairs; eyes obsolete.

The species of this genus are numerous beneath stones.

Type of the genus, and—

Illustration: *Polydesmus complanatus*.

LITHOBIUS. Antennæ setaceous, composed of nearly conical joints, the two first joints the largest; lips broadly cut in front; upper edge toothed, and the eyes bent; legs fifteen pair, the upper half of many of the rings hid under the other.

Type of the genus is *L. forficatus*; the *Scolopendra forficatus* of Linnæus, common in the gardens in summer.

Illustration: *Lithobius vulgaris*.

GLOMERIS. Body oval, oblong, crustaceous, revolute, with a row of small scales on each side, of eleven or twelve segments, the last the largest, semicircular; antennæ enlarged at their tips.

Type of the genus, *G. ovalis*. Found in the Ocean.

Illustration: *Glomeris zonatis*.

JULUS. Body cylindrical, very long, spirally twisted, formed of a great number of narrow rings, most of which are provided with two pair of legs; rings not keeled on the side.

These insects do not, as might be expected from the number of their legs, move with quickness; their motion is rather to be compared to the crawling of an earth-worm. When at rest, they generally lie on one side, the body being contracted into a spiral form, with the head in the centre. They are oviparous, and when they are first hatched their body is simple, worm-like, without any legs; in eighteen days they assume the shape of their mothers, but at first their body is only formed of twenty-two rings and twenty-six pair of legs; on each successive change of skin the animal gains several pair of legs, till the body is composed of fifty-five rings in the males, and sixty-three rings in the females. The animal throws off the skin, not only of the body but also of the whole head, and of the *trachea* and digestive canals. They generally live in sandy places, and the smallest of them amongst moss and under the bark of trees. There are only a few species found in Europe; the largest belong to America.

Several of the species are phosphorescent, and are often taken for glow-worms.

Type of the genus, *J. terrestris* of Linnæus.

Illustration: *Julus sabulosus*.

CLASS X.—ANNELIDA. EARTH-WORMS, ETC.

ANNELIDS are the only Animals of the Invertebrate Series that have red blood. They are mostly cylindrical in form, as the *Nereis*, *Eunice*, and *Earth-worm*, though some are found of an ovaloid shape, as the *Sea-mouse*. Their general covering consists of a series of rings, or segments of soft tegument, varying in different genera from twenty to more than five hundred, connected by thinner bands; and all of them, except the Earth-worms, live in water. The Annelids form a small and singular Class of Animals.

ANNELIDS are thus divided:—*Suctorial* (Leeches); *Terricolous* (Earth-worms); *Tubicolous* (Inhabitants of tubes); and *Errantes* (Wanderers).

The *Leech* (*Hirudo*) is too well known to require description; it was formerly found in several parts of England, but is now rare. It is said that four or five of the principal London importers of medicinal Leeches bring over from the Continent of Europe the amazing number of 8,000,000 annually. These are chosen from their having sharp, simple teeth, which consequently make a wound easily healed; whereas the other leeches have generally blunt, or serrated teeth.

Leeches breed in streams; live on animal substances; are active during the day, immoveable at night; are affected greatly by changes in the state



Leech.

of the atmosphere; and can live for a long time without food, owing to the slowness of their digestion.

The *Earth-worm* (*Lumbricus*) is chiefly remarkable for its power of

reproduction, if the division be made near the head, or close to the extremity of the tail; for the body, remaining alive, renews either of those extremities. But if the animal be severed in the middle, life becomes extinct in a few hours.

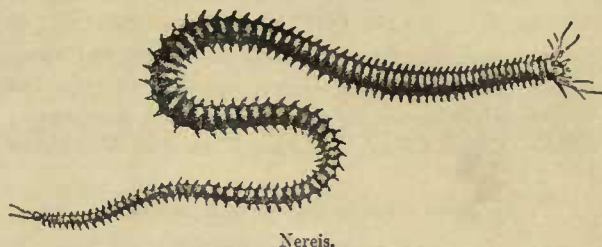


Group of *Serpulæ*.

The *Tubicolous* Annelids are represented by the genus *Serpula*, the generic characters of which are—Animal inhabiting a solid, calcareous tube, more or less irregularly twisted and fixed upon some extraneous substance; its body elongated, slightly depressed, and attenuated behind, composed of numerous narrow segments, armed on each side with a row of subulate and hooked bristles; branchiæ terminal, fan-shaped, divided into numerous plumose digitations; mouth terminal, situated between the branchiæ, and surrounded by a pedicellate funnel or club-shaped operculum.

Type of the genus, *S. vermicularis* (Linnaeus). Several species occur, both recent and fossil; of the former, five or six are found on the coast of Britain.

The *Errantes* are formed for locomotion, thus presenting a striking contrast to the *Tubicolous* tribe. The genera are found to vary in size from



Nereis.

one or two inches to fifteen or sixteen feet. Some of the *Errantes* are common around the coasts of England and Ireland. The *Nereis* belong to this division.

CLASS XI.—ECHINODERMATA.

THE tubular feet with which the Star-fish, Sea-urchins, and Holothuriæ are furnished, led Cuvier to place them together in his *Pedicellate* Order; but their form and internal structure vary so considerably, that they are justly entitled to be ranged into an independent Class, having three distinct Orders.

ORDER I.—ECHINOIDA. SEA-URCHINS.

THE *Echinoid* Order (printed *Echidna* by mistake on Plates 1 and 2). This division is generally known by the name of *Sea-urchins*, or *Sea-eggs*, their exterior consisting of a calcareous shell, which in some, as the *Echini*, has a flattened spheroidal shape, its mouth, armed with five strong teeth, being below, and the vent above. In others, as *Galerites*, it has a conical form with swelling sides, the mouth is central in the base, and the vent at its edge; and in some, as the *Spatangi*, its inferior surface, of an oval shape, flat or slightly hollowed, has towards its front margin a transverse toothless mouth, and the vent near its hind edge, whilst its upper surface is more or less convex.

Character of the group. Body not contractile, nor radiately lobed, mostly globular; skin hard, furnished with tubercles provided with mobile spines; digestive canal having a mouth and vent.

The shell of these animals is composed of numerous regularly-disposed plates, united on all sides by a straight suture, and furnished externally with rounded tubercles, on which the mobile spines are attached. The pieces form twenty perpendicular bands, each composed of several horizontal pentagonal pieces; the bands are placed symmetrically in pairs, uniting together by a flexuous suture; the projecting angles of one series being fitted into the concave angles of the other. The pairs of bands are united together generally by a straight suture, and the pairs are alternately broad and narrow. The broad bands are formed of a few pieces, and are always imperforated, and the outer edge of the narrow bands, which consist of very numerous long narrow pieces, are perforated by two or more series of minute holes placed together in pairs; these perforations form grooves in the covering of the body, which Linnaeus compared to the walks in a garden, and called *Ambulacra*; and he distinguished the parts which are covered with tubercles by the name of *Areæ pulvilli* or beds.

The spines are attached to the base of the tubercles by a circular ligament, lined with muscular fibres moving them in every direction.

The plates are placed between the two skins with which the body of these animals are covered; the outer of these skins is the thickest: it is greatly thickened near the vent and mouth; and the plates, which are composed of fibres perpendicular to their surface, and increase in size by the addition of particles to the inner side of the fibres, and by the formation of new ones on the sides of the older, are kept separate from each other by a

small process of the skin being interposed between them, so that they never become soldered together during the life of the animal.

The spines evidently grow by a deposition of matter placed on their outer edge, more especially near the distal extremity; the matter is perhaps deposited by the processes of the outer skin, which forms the articulation, being extended up the longitudinal grooves with which these spines are furnished.

The vent is surrounded by numerous small scale-like pieces attached to the skin, which are generally regularly disposed, but vary in the different families. In the typical families, where the vent is placed on the centre of the back, just opposite to the mouth, it is surrounded by two series, each formed of five pieces, which are attached to the body of the crustaceous covering; the series of these plates which are next the body are the smallest; they are placed just at the top of the *ambulacra*, and each is perforated with a minute hole, the use of which is quite unknown.

The mouth varies in the various families of the group in the *Spatangidae*; it is destitute of any hard parts, but is furnished with tentacula, compared by some to the similar parts in the *Holothuriæ*. In the *Scutellidae* it is furnished with five triangular cellular bones, each provided with a blunt, arched tooth at the inner angle, which apparently serves for crushing the food; while in the typical families this part is furnished with a much more complicated apparatus, with short prominent teeth fit for biting their food. These jaws were compared by Aristotle to a lantern; they consist of ten conical triangular bones, soldered together in pairs, containing between them a long linear curved tooth. The teeth are externally convex, and furnished with an internal central rib, and the end hardens as they are worn away by use. These jaws are articulated together by the intervention of oblong bones converging towards the centre, and furnished with five other linear arched bones. The jaws are moved by muscles placed between them, and by others attached to five variously-formed erect processes, placed on the oval edge of the body of the crust, called *auricules* by Blainville.

Breynius, in 1732, divided the *Echini* into seven genera, from the position of their mouth and vent; which arrangement Lamarck adopted, but under other names. Klein subsequently divided them into nine sections, containing twenty-two genera, of which he formed two systems. Leske published, in 1778, an addition to Klein; in which he considered Klein's sections as genera, and adopted the prior names given by Breynius. To the genera of Breynius, Lamarck, who wrote from actual examination of the class, has added a new genus, which he names *Cassidulus*.

The following division was proposed by Mr. J. E. Gray, in the "Annals of Philosophy" for 1826:—

I. Body globular, mouth and vent opposite.

ILLUSTRATIVE EXAMPLES.

PLATE 1.

1. Cidaridæ, containing the genera *Diadema*, *Cidaris*, and *Astropyga*.

Illustrations: *Diadema fistularis*, *Cidaris imperialis*, *Astropyga radiata*.

2. Echinidæ, which contain the genera *Echinus* and *Echinometra*.

Illustrations: *Echinus miliaris*, *E. elegans*, *E. sardicus*, *Echinometra mamillatus*.

II. Body variously-shaped, vent posterior.

ILLUSTRATIVE EXAMPLES.

PLATE 2.

3. SCUTELLIDÆ, which includes the genera *Echinanthus*, *Echinarachnius*, *Eschinodiscus*, *Echinocyamus*, and *Cassidulus*.

Illustrations: *Echinanthus subdepressa*, *Echinarachnius placenta*, *Echinodiscus digitata*, *Cassidulus Australis*.

4. GALERITIDÆ, having the genera *Galeritis*, *Discoidea*, *Echinonauus*, *Echinocorys*, *Echinolampas*, *Echinobrissus*.

Illustrations: *Galerites albo-galerus*, *Echinonauus minor*, *Echinolampas Kænigii*, *Echinocorys ovatus*, *Echinobrissus Breynii*.

5. SPATANGIDÆ, containing the genera *Echinodardium*, *Spatangus*, *Brissus*, *Ora*.

Illustrations: *Echinodardium atropos*, *Spatangus purpureus*, *Brissus unicolor*.

The species of Echinoida have been described and figured by Klein and Leske, in their *Echinodermata*; and their figures have been mostly copied into the French "Encyclopédie Méthodique."

The fossil species have been described by the same authors.

Many of them are used as food by people resident on the sea-coast, who generally reckon them delicacies, especially when their ovaries, which are very large, and nearly occupy the whole body, are full of eggs.

ORDER II.—STELLERIDA. STAR-FISH.

THE *Stellerida*, *Asteroid*, or *Radiated Order* (Radiata, on Plate 3), as the name implies, is star-shaped; the body or central part, containing the stomach, having rays stretching out from its margin, of greater or less length and number. Thus in one section of the genus *Asterias*, the body is pentagonal, and the slightly hollowing out of its edges hardly produces arms or rays, as in the *Gibbous Star-fish*, whilst in the other section of the same genus, the body is deeply cleft, and the rays are of great length, as in the *Red Star-fish*. In the *Ophiure*, the arms are of great length, and in *Euryale*, each arm, directly it stretches out beyond the body, divides into two branches, and these again into others, which again and again divide, assuming the appearance of interweaving branches of a tree, and which they employ for entangling their prey.

The general characteristics of the Order are:—Skin not irritable, but mobile; body depressed and furnished with mobile angles or rays; digestive cavity, with only one opening. Containing the genera *Asterias*, *Ophiura*, *Euryale*, and *Cromatula*.

ILLUSTRATIVE EXAMPLES.

PLATE 3.

ASTERIAS. Body suborbicular, flattened, the circumference star-shaped, either angulated, lobated, or divided into distinct rays. Under surface of the division having a longitudinal sulcus, furnished at each side with moveable spines and numerous foramina for the passage of retractile tubular tentacula. Mouth below, central, placed at the union of the sulci.

The animals of this genus are well known to our fishermen under the names of Star-fish and Sea-stars; and several species are excessively destruc-

tive to Oyster-beds. They increase by the internal formation of a kind of buds or gemmæ, which when fully formed are cast forth by the parent. They possess the power of reproducing mutilated parts to a great degree, so that not only a separated portion is speedily re-supplied, but if an individual be divided into as many parts as there are rays, provided a portion of the mouth be attached to each, every ray will become a perfect *Asterias*. The fishermen, by whom they are much dreaded, appear to be well aware of this property, for if, in dredging for Oysters, any of these animals are brought up, they immediately cut them into small pieces, and crush them to atoms with their feet. The species are numerous, and many of them are natives of Britain.

Illustration: *Asterias pulchella*, *A. cylindrica*.

OPHIURA. Mouth simple, five-sided, placed beneath; body much depressed, rounded, with five distinct, entire, squamous rays with very spinous ridges, the latter with suckers; spines moveable.

Type of the genus, *Asterias nigra*.

Ten species, most of which are found on the sandy shores of Great Britain.

Illustrations: *Ophiura mutica*, *O. Lamarckii*, *O. Squamosa*, *O. lineolata*.

EURYALE. Body orbicular, depressed, divided into five rays, separated into two at the base, and repeatedly forked; arms without any groove on the lower surface, but furnished with a semilunar hole on each side of their base, and a series of minute perforations on each edge.

The singular form of these animals generally attracts attention; they are usually found, like the *Ophiuræ*, with their much-divided arms clasping the stems of the marine *Algæ* and *Corallines*. There are seven species.

The type of the genus is *E. verrucosa*, Lamarck—the *Asterias Euryale* and *Asterias Caput Medusæ* of Gmelin; found in the Indian Seas. This is larger than most of the other species, and it is studded externally with granular warts.

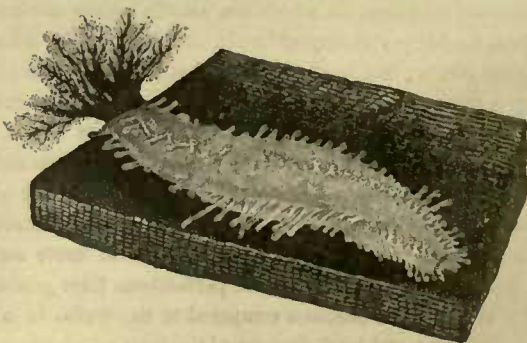
Illustration: *Euryale simplex*.

ORDER III.—HOLOTHURIA.

THIS Order differs from either of the other Echinodermous Orders in the skin being entirely devoid of any earthy contents, but it is very thick and strong, consisting of a whitish fibrous tissue, which interweaves in various directions, leaving apertures for the passage of the dorsal tubes, which penetrate through several wart-like projections on the back, and for the protrusion of the feet upon the belly, which are in great numbers.

The characters of the restricted genus of this Order are:—Body free, cylindrical, thick, soft, and very contractile; skin coriaceous, generally papil-

lary; mouth terminal, surrounded by laterally divided, rather branchy, or pinnated gills, armed with bony or calcareous teeth; vent near the hinder extremity. The animal is of a tubular form, and upon its fore extremity is a



Holothuria.

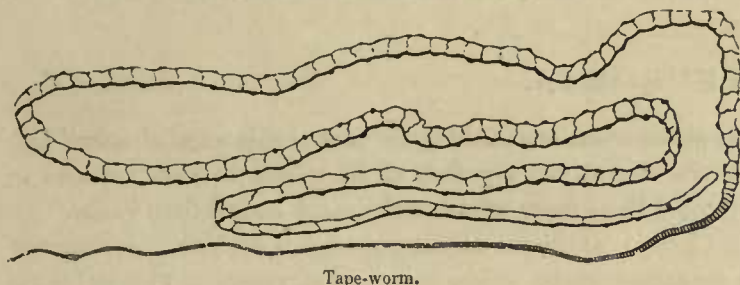
crown of twenty tentacles disposed in two rows, and having the extensile mouth in the centre, each tentacle being cylindrical, and having its expanded end fringed. A longitudinal section of the external skin exhibits the apparatus by which both tentacles and feet are moved, and which has a close resemblance to that of the other Orders, but rather more simple.

They live on animal substances, which they draw to their mouth by their gills. Their stomachs are filled with pieces of coral, which are, perhaps, useful in assisting digestion; although not provided with fins, they swim with great facility.

CLASS XII.—ENTOZOA. INTESTINAL-WORMS.

RUDOLPHI applied the name *Entozoa* to those Animals which live within the internal parts of others, and divided them, from their form, &c., into the Cystic, Cestoid, Trematode, Acanthocephalous, and Nematoid Orders. These, however, have been reduced by Cuvier to two, 1st, the Parenchymatous, including Rudolphi's first four, of which the body is filled with a cellularity, or even a continuous parenchyma, and in which the greatest development of alimentary organs appears merely as ramifying canals with external apertures; 2nd, the Cavitary or Nematoid, in which the external covering encloses a cavity, containing a distinct alimentary canal with mouth and vent. Instead of these designations, Owen prefers the names *Sterelminthous* for the former, and *Cœlelminthous* for the latter Order.

The *Sterelminthous* Order have no distinct cavity for their alimentary apparatus, which consists of simple pores in their tegumentary covering, or mere tubes continued from their mouths, without any other exit. They exhibit very considerable difference in form, varying from the globular shape of the *Acephalocyst*, to the lengthy, flat, tape-like *Tænia*. The Tape-worms are of considerable length, varying from three to ten feet, are flat, and are divided into segments, the hinder edge of one slightly overlapping that which follows. The two genera infesting the human body are remarkably distinguished from each other: the *Tænia solium*, which exists in the English, Dutch, and Germans, has its fore part or neck narrow, and merely marked by transverse rugæ, but the greater part of the body consists



of oblong square segments: the head is small, wider than its length, has a papilla, hooklets, and four mouths. The *Bothriocephalus latus*, which is peculiar to the Russians and Swiss, is nearly of the same thickness throughout, its segments are much wider than their length; and its head, lengthy, without hooklets or mouth, has on each side a longitudinal cleft, or *bothria*, by means of which their food is sucked up.

The characteristics of the genus *Tænia* are: Body often of very great length, jointed, and tapering towards its anterior extremity; head squarish, with four mouthlets, and sometimes with a trunklet; in each joint one or two ovarian apertures.

The *Cœlelminthous* Order include, among others, the *Ascarides*, one species of which are of common occurrence in the human subject. They are found not only in the intestines of man, and of the higher classes of animals, but in those also of reptiles, and even of other worms. The sexes are distinct, and the female is oviparous. The most important species, because the only one which infects the human body, is *Ascaris lumbricoides*. This species is not less than from six inches to nearly a foot in length, of a whitish colour, shining, and somewhat hard and rigid in its structure.

The generic characters of the *Ascarides* are:—Body elongated, round, often attenuated at the extremities; three valves at the anterior extremity. Mouth terminal, minute, covered by the valves.

CLASS XIII.—ACALEPHA. SEA-NETTLES.

THESE Animals are mostly of transparent, gelatinous structure, and hence commonly known by the names of *Sea-blubber* or *Jelly-fish*; or, from the stinging sensation they impart when touched, *Sea-nettles*: this property was observed by the ancients, and hence also the name *ακαλήφαι*, applied to them by Aristotle. They are furnished with locomotive organs, are capable of translating themselves from place to place, and most of them are highly phosphorescent.

ILLUSTRATIVE EXAMPLES.

PLATE—ACALEPHA.

Ehrenberg divides the Acalephs into three Orders:—

1. The *Ctenophorous*, or *Crested Order*, is characterised by longitudinal rows of cilia or vibrating threads arranged in pairs, so as to form narrow passages, which being connected with these locomotive organs are called *ambulacra*. Their form is either a flattened spheroid, truncated at one extremity like a deep cup, so as to form the aperture leading to the large simple stomach, as in *Beroë* (*Acaleph*. Plate, fig. 1); or a much-compressed ovoid, as in *Mnemiæ*, or a cylinder, with a pair of flatted wings, as in *Callianira* (fig. 2), or a long flat ribbon, in the middle of which is the stomach, as in the beautiful *Cestum Veneris* or Venus' girdle (fig. 3).

2. The *Sciaphorous Order* is distinguished from the other Orders by the umbrella-shape of the body. This peculiar shape varies considerably: sometimes, as in *Berenice* (fig. 4), it is nearly flat, sometimes semiglobular, as in *Geryonia* (fig. 5), sometimes the lower edge is everted, like a bell, as in *Oceania*, or contracted, as in *Pelagia* (fig. 6). The body is deepest in the centre, and gradually thin towards the margin, where the convexity and concavity unite. The margin is sometimes entire, as in *Eudora* and *Ephrya*, or lobed as in *Cyanea*, or fringed with tentacles few in number as in

Geryonia, or very numerous as in *Æquorea* (fig. 7). The body of this Order of Acalephs is a softish, jelly-like mass, loaded with water, transparent, generally colourless, or varied with brilliant hues; it is firmer about the mouth and roots of the arms, and about the margin, than elsewhere. When removed from the water, it soon dissolves almost entirely into a saltish fluid, so that of an animal which had weighed fifty ounces, or even twenty or thirty pounds, but a few grains remain. The motions of these Acalephs are sometimes active, sometimes passive; if desirous to move forwards or upwards, they approximate the two halves of their margin together, so that the convexity is bent still more like a bent bow, after which the contraction suddenly ceases, and the animal is jerked onwards; having arrived near the surface, their umbrella remains outspread, and they are borne along by the mere motion of the waves, till they choose to descend, which is effected by contracting the whole disc and forming a ball, after which they sink. In *Æquorea*, the mouth which is circular is surrounded with a simple rounded edge, which sometimes exhibits four or six folds, or very slight notchings; but in *Aurelia* (fig. 8), which has the mouth cruciform, the edge is lengthened at each angle into a clasper, which is of a somewhat trigonal form, rounded above, and hollowed slightly throughout the whole length of its under surface or base. The many-mouthed or

sucking *Acalephs* are of two kinds: 1. Those in which a simple cylinder or pedicle depends from the centre of the concavity of the body, as in *Geryonia* (fig. 5). 2. Those in which from four to eight processes or claspers dip down, either distinct or connected together, as in *Rhizostoma* (fig. 9).

3. The *Siphonophorous Order* are remarkably distinguished by the absence of any stomach or alimentary cavity, and are divided by Eschscholtz into three families:—

1. The *Diphydous Acalephs*, so named from their seeming resemblance to two animals connected together, which originates in their body being composed of two somewhat conical pieces, the apex of the posterior being received within the base of the anterior. These pieces Quoy and Gaimard describe as having an independent life, and capable of living for some time after their separation. The anterior segment of the animal is considered by Eschscholtz to belong to the nutrient part, and the posterior segment he thinks is the swimming organ. The sucking claspers, of which there are about twenty, are rolled up when at rest into as many little balls, but when outspread, form delicate threads three or four inches in length, as in *Diphya* (fig. 10).

2. The *Physaphorous Acalephs* are characterised by a bladder containing air, situated upon their upper extremity, by means of which they are floated like hydrometers: hence Cuvier has applied to them the name *Hydrostatic Acalephs*. The most simple form is that of *Rhizophysa* (fig. 11), in which the transparent egg-shaped air-vesicle has its middle surrounded by hollowed

pieces of cartilage, and from its lower end floats loosely its long tubular body, from the sides of which project the simple claspers, which, as in the preceding family, serve the purpose of suckers. In *Physophora* (fig. 12), the tubular alimentary canal is short; at its upper end is the air-vesicle, and below it two rows of hollow cartilaginous pieces, which are followed by a collar of delicate flask-like bags, containing fluid concealing the origin of the claspers, which surround the extremity of the body, and of which the form and length are very variable and elegant. The *Physalia* (fig. 13) differ from the preceding, in having no cartilaginous organs; their air-vesicle is large and oblong, with thick semitransparent walls; its long axis is horizontal; at one end there is an aperture by which the air can escape, and upon its upper surface a beautiful crest extends nearly throughout its whole length, whilst beneath are sent down numerous tentacles and sucking organs.

3. The *Velelidous Acalephs* have within their soft substance a cartilaginous or calcareous plate or disc, either circular or consisting of two pieces, by the union of which an oblong body, either flat, or elevated to form a crest, is produced. In *Vellella* (fig. 14) the disc is cartilaginous, consisting of two pieces and oval; upon its upper surface is attached obliquely another cartilaginous plate enveloped in muscular substance. In *Porpita* (fig. 15) the disc is round, calcareous, and marked above with concentric circles traversed by radiating stripes, but has not any crest. The sucking organs are in all the genera placed on the under surface, and the central one, which is largest, has been considered analogous to a stomach.

CLASS XIV.—INFUSORIA.

THIS Division of the Animal kingdom, formerly considered by microscopic observers as exhibiting the most simple forms of animal life, has of late years been shown, by the observations of Bory de St. Vincent, and especially of Ehrenberg, in most instances to consist of very complicated structures, and generally to be far advanced above many animals which much exceed them in size.

They are divided by Ehrenberg into two Classes, the **POLYGASTRIC Class**, in which the alimentary canal is divided into numerous cavities or stomachs, and the **ROTATORY Class**, furnished with a remarkable organ, which, in its motions appearing to resemble the turning of a wheel, is called the wheel organ. The latter class is more advanced in the scale of development than the former, but it is convenient to consider them together, especially as they present many points in common as regards their covering and motive organs.

ILLUSTRATIVE EXAMPLES.

PLATES 1 and 2.

External Covering.—In both Polygastric and Rotatory Classes some kinds have no special covering, such are called by Ehrenberg, naked, *nuda*; whilst others, inclosed in a sort of armour, *lorica*, he calls covered, *loricata*. Of this covering or armour he describes five kinds:—

1. The Shell, *testa testula*, a firm skin, often furnished with little teeth, horns, spines, points, or warts. Usually in the Loricated Rotatory Infusories it is depressed, as in *Brachionus amphiceros* (Pl. 2, fig. 33), but sometimes compressed, and resembling a bivalve shell, for which it has been often mistaken, as in *Colurus caudatus* (Pl. 2, fig. 26). 2. The Target, *scutellum*, *scutellulum*, seems to be peculiar to the Polygastric Class: it is firm, round, or oval, smooth edged and only covering the back of the animal, as in *Aspidisca denticulata* (Pl. 1, fig. 60) and *Euplotes Charon* (Pl. 2, fig. 7). 3. The Pitcher, *urceolus*, is a membranous or firm covering, often cartilaginous, bell-shaped, cylindrical, or conical, closed at bottom, open and expanded in front, within which the animal can either retract entirely, or project itself from it: as in *Distuglia proteiformis*, *Vaginicola crystallina* (Pl. 1, figs. 22 and 48), and *Floscularia ornata* (Pl. 2, fig. 16). Sometimes, as in *Ophrydium versatile* (Pl. 1, fig. 46). 4. The Cloak, or Mantle, *lacerna*, which exists only in the POLYGASTRIC Class, is a thick gelatinous mass or skin, apparently the external layer of the animal itself, expanding with age, and under the protection of which, the internal parts of the body freely divide, according to certain normal proportions, and inclose other individuals which become loose upon the surface of the parent. After a time this membrane loses its individuality, becomes subservient to the wants

and will of the internal brood, and performs to them the office of a tegumentary covering, as in *Volvox globator* (Pl. 1, fig. 12). 5. The Bivalve Target, *lorica bivalvis*, exists only in the large family *Bacillaria*, is of a quadrangular prismatic form, of a siliceous nature, and when dry splits into two or more species, as in *Navicula phaniceutron* and *Bacillaria vulgaris* (Pl. 1, figs. 28 and 29).

In most of the Infusories, a head, trunk, and tail are distinguishable. 1. In the Polygastric Class the Head is scarcely discernible, but in the Rotatory it is readily distinguished, forms the anterior part of the body, and supports the wheel organ, eyes, mouth, and masticating organs; in it also is the great nervous ganglion, which Ehrenberg presumes to be the cerebral. The mouth is generally placed beneath, and not precisely at the anterior extremity, which is formed by the projection of the forehead, distinguished by the red eye-spots, and often also stretches like a proboscis beyond the wheel organ, as in *Rotifer macrurus* and *Philodina aculeata* (Pl. 2, figs. 29 and 30), or drops into the anterior upper edge of that organ, as in *Furcularia gibba* and *Diglena grandis* (Pl. 2, figs. 20 and 21). Sometimes, as in *Brachionus amphiceros* (Pl. 2, fig. 33), the forehead is divided into three lobes, covered with little hairy styles. In *Rotifer*, the eyes stand far forwards on the proboscis, but in *Philodina*, on the contrary, they are backwards above and behind the mouth. Sometimes the nape of the neck is indicated by a narrowing, but more commonly by the base of the wheel organ or by the position of the eyes. The mouth is often provided with a pair of lips, which may be seen in both the POLYGASTRIC and ROTATORY Classes, as in *Chilomonas volvox*, *Euglena viridis* (Pl. 1, figs. 5 and 17), and in *Meliceria ringens* (Pl. 2, fig. 17). In the POLYGASTRIC Class, as in *Lachrymaria*

proteus (Pl. 1, fig. 50), the neck is very distinct, a long gullet passing from the mouth to the stomach; but it is scarcely if at all discernible in the ROTATORY Infusories. 2. In the POLYGASTRIC Class the Trunk is less readily distinguished than in the ROTATORY, where it begins behind the base of the wheel organ, but its dorsal and abdominal surfaces are readily distinguished by the apertures of the mouth and vent being on the latter. The genera *Enchelys*, *Coleps* (Pl. 1, figs. 49 and 53), are exceptions, as their mouth and vent are in the very centre of their extremities, and the absence of eyes affords no other guide. 3. The Tail is all that part of the animal beyond the vent, and may be compared to the foot of Molluscs. In the POLYGASTRIC Class it is most simple, as in *Astasia hamatodes* and *Amphileptus fasciola* (Pl. 1, figs. 16 and 59). In the Vorticellinae (Pl. 1, fig. 44), a long process is sent out, on the tip of which is a sucker. Its simplest form, in the ROTATORY Class, is a mere lengthening of the soft body from the abdominal surface, with a sucking cup, *patella*, at its extremity, by means of which it can fix itself, as in *Glenophora trochus* and *Pterodina patina* (Pl. 2, figs. 11 and 34); sometimes a long stiff shank supports the sucking cup, as in *Monura*, *Monocerca*, &c.; but the greater number of this class have the tail bifurcated, as in *Icthydium podura*, *Chaetonotus maximus* (Pl. 2, figs. 9 and 10), &c., and in the genera *Furcularia* and *Euclanis* (Pl. 2, figs. 20 and 25) these forked processes are of considerable length. In *Rotifer*, *Philodina* (Pl. 1, figs. 29 and 30), and some others, the tail is capable of retraction within itself like the joints of a telescope; and such are often armed with little horny points, sometimes in pairs, as in *Rotifera*; sometimes in triplets, as in *Philodina*.

Motive Organs.—The organs of motion in Infusory animals are either simple or compound.

The most remarkable of the Simple Motive Organs are the Changeable Processes, *processus variables*, which belong entirely to the POLYGASTRIC Class, and result from the power which those animals possess, of protruding at pleasure parts of their body into variously-shaped lobes and long tubes, at one or many points at the same time or alternately, and hence arise the protean changes for which many Infusories were so celebrated, but of which the cause was not known till discovered by Ehrenberg. According to his observation, this change of form depends upon the animal relaxing the part to be protruded, and then, by the contraction of the rest, thrusting the stomach and its contents against the relaxed part, and projecting it in a finger or foot-like form, just as the hernial sac is produced by the intestine being protruded from the belly. In this way is it that all parts of the *Amœba* (Pl. 1, fig. 21) can be thrust out into processes. But in the *Arcellinae* the projections can only be formed on the fore part of the body and by the propulsion of a transparent fluid, not, as in the former case, of the alimentary canal. The *Bacillariae* have also this remarkable property. This power of changing form, and thrusting out processes, is well adapted for pushing the animal along, in much the same way as a boat is pushed by a pole. In many Infusories, stiff, straight, and long bristles, *setæ*, are observed, implanted in the animal substance, and are capable of slow elevation and depression. The Hairlets, *ciliæ*, by which the turnings about of the Infusories are effected, are distinguished from the bristles by their bulb-

shaped base, which, moving slowly upon their seat by means of a pair of muscles, produce extensive circular swinging of their point; this can be well observed in the larger species of *Stylonychia* (Pl. 2, fig. 4) and *Kerona*. In the Polygastric Infusories they are often spread over the whole body, and are arranged in distinct rows, generally longitudinal, but sometimes transverse; sometimes they exist only about the mouth, and, in the ROTATORY Class, on no part except on the wheel organs. The whole body is only covered with these cilia in the Naked Infusories, with one solitary exception, the genus *Coleps* (Pl. 1, fig. 53), the armour of which consists of numerous little pieces, placed in rows, and the interspaces studded with cilia. Hooklets, *uncini*, are sometimes observed, either ranged upon the abdominal surface, as in *Stylonychia* (Pl. 2, fig. 4) and *Euplotes*, and serving as feet or claws, or occupying the place of an upper lip, as in *Glaucoma Colurus*, and *Scaridium*. Thick, straight, and very moveable bristles, called styles, *styli*, exist in both classes of Infusories, having a distinct articular connection with the surface of the body; they are very distinct in *Oxytricha cicada* and *Stylonychia pustulata* (Pl. 2, figs. 3 and 4), upon the hind part of the body, and seem to be employed for feeling.

Compound Motive Organs belong specially to the ROTATORY Class of Infusory Animals, of which they constitute one of the most remarkable characters. They are formed by the collection and arrangement of numerous cilia, or hairlets, about the front of the body, which turning or moving upon their base independently of each other, produce an appearance so closely simulating that of a wheel turning upon its axle, as to have led the microscopist Baker to describe them as actually so formed, and hence has been applied to them the name of *Wheel Organs*. The wheel organs are either *Monotrochous*, i. e. have a simple connected ring of cilia, or the ring is divided or manifold, as in the *Sorotrochous* Infusories. In the *Monotrochous* section, the circle or wheel is of the most simple kind, and is placed near the mouth, which is not contained within but on one side of it, interrupting the ring, so that, instead of being circular, it has the shape of a horseshoe closely set with cilia, between the heels of which the mouth is placed. If the periphery of the wheel be regular, as in *Ptygura melicerta*, *Icthydium podura* (Pl. 2, figs. 8 and 9), such Infusories are called *Holotrichous*; but if it be indented and produced here and there into lobes, as in *Microcodon clavus*, *Tubicularia najas*, and *Floscularia ornata* (Pl. 2, figs. 14, 15, and 16), such are said to be *Schizotrochous*. Two subdivisions of the *Sorotrochous* are also observed, the two-wheeled or *Zygotrochous*, in which the wheel organs are implanted on a pair of processes like arms, capable of protrusion and retraction, situated close to each other, and between the mouth and proboscis, as in *Rotifer macrurus* and *Philodina aculeata* (Pl. 2, figs. 29 and 30). Those which have more than two wheel organs are called *Polytrochous*, such as *Hydatina brachydactyla*, *Euclanis luna* (Pl. 2, figs. 19 and 25).

The use of the cilia, whether simply disposed about the mouth or forming wheel organs, is to produce a current in the water by means of which the food is brought to the mouth, and also to serve the purposes of locomotion by swimming, which in some genera, as in *Philodina*, is restricted to crawling, like leeches, prior to the development of the wheel organs.

CLASS XV.—POLYPS.

ALTHOUGH in the living film which overspreads the Sponges, no distinct animal form can be observed, yet in that which envelopes the several kinds of marine productions, commonly known as Madrepores, Corals, &c., and which have either a cartilaginous, horny, or calcareous substance, distinct animal forms are seen, of a jelly-like, semitransparent nature, cylindrical in form, with an intestinal cavity having a mouth surrounded by many lengthy processes or arms (whence their name POLYPS), and their opposite extremity or foot attached to the cavities in which they reside. The whole animal is capable of motion, by the expansion and contraction either of parts or the whole of its entire mass, and thus can project itself to a certain extent out of its chamber, expand its arms or tentacles, and sway both them and its cylindrical body in all directions so as to bring it in contact with the prey it desires to seize, around which it throws its arms, and clasping them conveys it to its mouth. The cavities in which these Polyps live are called *Polyparies*, which are either sunk in a mass of fleshy substance overspreading the axis or solid stem, supporting and giving

form to the whole animal structure; or a quantity of earthy matter is deposited in this encrusting mass, and more or less solid cavities produced in which the Polyps reside.

Some Polyparies are fixed, that is, their stems are attached by broad bases or roots to some stone, rock, or other substance proportioned to their size. But there are others which, although residing in a common fleshy substance overspreading a solid axis, are unattached, that is, the whole mass floats loosely in the water. Some of the Polyps, however, are not contained in or attached to any polypary cavity, but are naked, gelatinous, independent animals, moving about at their own pleasure; these are called *Naked Polyps*.

ILLUSTRATIVE EXAMPLES.

PLATE—POLYPS.

CORNICULARIA. Polypary fixed by the base, horny; twigs simple, funnel-shaped, erect, each containing a single polypus; polypi solitary, terminal; mouth with eight pinnate tentacula, disposed in a single series.

Illustration: *Cornicularia rugosa*.

TUBIPORA. Polypary of rocky hardness, composed of cylindrical tubes, straight, parallel, separate, but connected by external transverse collars; tubes jointed, and communicating by radiating and porous collars. This polypary appears like a mass of minute organ-pipes banded together, and hence its common name *Organ Coral*.

Type of the genus, and—

Illustration: *Tubipora musicalis*.

RENILLA. Body compound, free, flattened, kidney-shaped, pedicellate, with one of its faces polypiferous, and with striated rays on the other; polyps with six rays.

Type of the genus, *Pennatulula reniformis*; it inhabits the American Ocean.

Illustration: *Renilla Americana*.

TUBULARIA. Polypary slender, tubular, horny, attached by its base; the extremities of its stem and branches each lodging a polyp; mouth furnished with two rows of naked, non-retractile tentacles, pouched at the root. This genus of Polyps is marine.

Illustration: *Tubularia elyptodea*.

CORALLIUM. Polypary fixed, plant-shaped, not jointed, covered with a cortical crust; central stem, branched, stony, solid, striated on the surface; crust consisting of a soft fleshy substance, containing the polypi; when dried, porous and hardened; cells scattered, eight-valved; tentacula eight, ciliated, and radiate at the mouth of the polypi.

The only species of this genus is the *Isis nobilis* of Linnaeus, so well known under the name of *Red Coral* (*C. Rubrum*), and which is manufactured into various ornaments. It is the production of the ocean in general in warm climates.

Illustration: *Corallium rubrum*.

GORGONIA. Coral plant-like, simple or branchy, branches sometimes anastomising; the axis longitudinally striated, hard, horny, and elastic; bark fleshy, and rarely chalky when dry; often friable: polyps contractile.

The genus contains many species, which have been divided into sections by Lamarck. The first, with the cellules superficial, prominent, granular, and tubercular; and in the second the cells cylindrical, or lip-shaped, and very prominent.

The type of the genus and most common species is the Venus's Fan, *Gorgonia Flabellum*.

Illustration: *Gorgonia patula*.

MILLEPORA. Stony, solid interiorly, polymorphous, branched or frondescence, furnished with simple pores, which are very minute, perpendicular to the surface, and giving to them a finely-striated fracture.

Type of the genus, *M. complanata*, Lamarck. Two of the species are natives of the coasts of Britain.

Illustration: *Millepora spongitis*.

BICELLARIA. Polyparium of a cretaceous substance; cells arranged in two alternate rows, their orifices, on one face of the polyparium; dichotomous, fixed by radical fibres, plant-like; polyps hydriform; tentacula eight.

Illustration: *Bicellaria fastigiata*.

SERIALARIA. Polypiferous mass branched, horny, with slender fistulous stems, furnished with cylindrical, parallel, adjacent, projecting cells, in linear masses, sometimes separate and sometimes continuous.

One species is found in the English seas, on fuci, below high-water mark.

Type of the genus, and—

Illustration: *Senalaria lengidera*.

CELLEPORA. This genus differs from the genus *Millepora*, by having a less stony structure, and being much less compact internally; and from the *Fluctra* in being less brittle, and having no flexibility.

Illustration: *Cellepora hyalina*.

LAOMEDIA. Coral flexible, branchy; cellules stalked, scattered on the stem and branches.

Illustration: *Laomedia dichotoma*.

PLUMULARIA. Stem not verticillated, horny, branched, with slender, fistulous stalks; cells sessile, uniformly distributed on one side of the branch.

Type of the genus, *Sertularia pluma*.

Illustration: *Plumularia secundaria*.

SERTULARIA. Polypiferous mass horny, with slender fistulous stems, and furnished with separate lateral, tooth-shaped cells, the latter projecting, alternate, usually with a joint above and below each; vesicles larger than the cells.

Type of the genus, *Serpula polygonias*.

Illustration: *Sertularia pumila*.

CARYOPHYLLIA. Polypary stony, fixed; the branches subturbinate, longitudinally striated, each terminating in a cell composed of lamellae, disposed in a stellated form. Body of animal elongated, and terminated with eight feathery radiated tentacula.

Illustration: *Caryophyllia solitaria*.

MEANDRINA. Fixed, stony, forming a simple, convex, or hemispherical mass; surface convex, occupied by compartments more or less hollow, sinuous, and furnished on each side with transverse parallel plates, which adhere to the elevated crests.

The type, *M. labyrinthica*, is found in the American seas.

Illustrations: *Meandrina limosa*, *M. Cerebriformis*.

ZOANTHUS. Body fleshy, somewhat cylindrical, club-like at top, slender below, and attached by its base along a fleshy creeping tube, from whence it originates; mouth terminal, and surrounded with retractile radiating tentacles.

Illustration: *Zoanthus Ellisii*.

ASTREA. Coral stony, fixed, conglomerate, encrusting other marine bodies, or aggregated into a subglobose mass; the upper surface only covered with orbicular or subangular, lamellated, sessile stars.

Illustration: *Astrea ananas*.

OCULINA. Polypiferous mass stony, generally fixed, branching; the branches smooth, thick, and very short; some of the star-like mouths terminal, the others lateral and superficial, spread over the surface.

Type of the genus, *Madrepora virginea*; inhabits the Indian Ocean.

Illustration: *Oculina varicosa*.

ACTINEA. The several kinds of Sea Anemones, *Actinæ*, are considered to belong to the Polyps, of which they form the *Fleshy Order*; their shape is that of a short hollow cylinder, highly contractile, the bottom or foot of which is capable of fixing itself very firmly; its sides are also contractile, and have a coriaceous consistence; a wide aperture on the upper surface

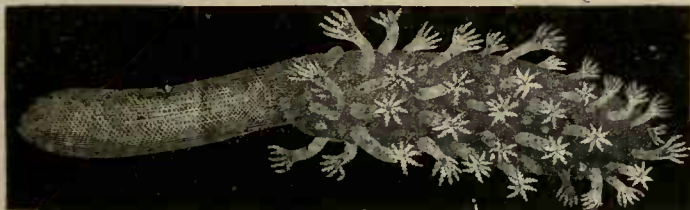
leads to the large stomach, which occupies the central part of the coriaceous cylinder; between the mouth and the upper edge of the cylinder an immense number of tentacles are ranged in a circular form, which can either be outspread like the petals of a flower, or retracted so as to be scarcely visible. These are the organs of prehension, but they have also much more important functions.



Actinea.

VERETILLUM. Polypary stalk-like, perforated longitudinally with four straight canals, which open externally at its lower extremity, and have the polyp-cells terminating in them, except at the lower fourth of their length, where the cells are deficient; polyps tubular, each with eight tentacles ranged about the mouth, which leads to the stomach, and this opening into the polyp-cell.

Lamarck describes two species of this genus, one Indian, *V. Phalloides*, and the other found in the Mediterranean, *V. Cynomorium*, of which a very interesting account has been given by Rapp, in the *Nov. Act. Phys. Med. Acad. Cæs. Leop. Car.* vol. xiv., who denies that either this genus or *Pennatula* float voluntarily, but says that they have their lower end plunged in the sand at the bottom of the sea, and that when placed in a vessel of water they may be observed moving about on its floor, but never swimming. He observes also, that, unlike the Freshwater Polyps, which expand themselves, and seem to enjoy light, the Marine Polyps prefer the shade, and that the polyps of the *Veretillum*, although expanding themselves in a darkened room, yet when brought into sunlight quickly fold themselves up. Their stalk is freely pervaded by sea-water through the four longitudinal canals which run through it, and communicating not only with the stalk-like polypary itself, but also with the cells in which the polyps are contained, and even with the tubular cavities of the polyps themselves. This genus is phosphorescent, and its luminous character depends on a thin mucus which overspreads its whole surface.



Veretillum.

HYDRA. The animals composing this genus are remarkable for their power of reproduction. Trembley, of Geneva, to whose investigations, published in 1774, we owe nearly all the knowledge we possess of their structure and habits, found that if a Hydra were cut into several pieces,—so many as forty, incredible though it appears,—each part soon became a perfect Hydra. This animal is destitute of any cavity around the stomach. The mouth (*a*) is surrounded by slender tentacula, armed with stinging bristles, with which it secures its prey, and conveys it to its mouth. The Hydra is common in stagnant pools, where it may be found attached to aquatic plants, or carried about on floating bodies. Its stomach, which consists of a simple sac, is capable of being contracted or distended into various forms. It feeds on minute crustacea or aquatic worms.

Hydra.
a, mouth.

CAMPANULARIA. Polypary plant-shaped, filiform, branched, horny; branches tubular; cups campanulate, toothed at the margin, supported on long tortuous peduncles.

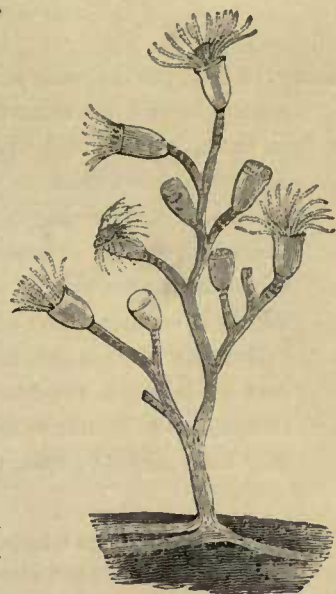
The *Campanulariæ* have considerable relation to the genus *Sertularia* with which they were combined by Linnæus; they are, however, readily distinguished by the twigs not being toothed at the sides by the little sessile cups. In *Campanularia*, the cups, instead of being attached immediately to the stem, are supported on foot-stalks, which are of considerable length, and tortuous at the base.

CORALLINA. Polypary fixed, plant-shaped, much branched, consisting of a central stem, incrustated interruptedly with a dense, calcareous, cortical substance; cells inconspicuous; polypi unknown.

There is still considerable obscurity with regard to the exact situation of the animals of this group of Corals in the natural system, arising from the very slight knowledge which is possessed of them. They have, it is true, been seen by Lamouroux, and by Ellis, but in so uncertain and undefined a point of view, that the observations of those Naturalists have thrown but little light upon the relations which they bear to the other groups. To the naked eye the cortical substance of the Corallines in a dry state, present not the slightest appearance of those little cellules, which in other genera are known to be the habitations of the animals; it is, however, asserted, that when recently taken from the sea, these pores may be observed over the whole surface of the articulations.

PLUMATELLA. Stem cylindrical, branching; simple, fixed by the base, at the extremities of the stems and branches terminated each by a polypus; the polypi, with a depressed mouth, and ciliated tentacula, disposed in a single row.

Type of the genus, *Tubularia repens*, Müller. Several species, inhabitants of the fresh waters of Europe; two are found in Britain.



Campanularia.



Corallina.



Plumatella.

CLASS XVI.—SPONGIA.

NOTWITHSTANDING the various inquiries which have been made in regard to the Class of Sponges, but little is known as to their true nature, beyond the anastomosing horny filaments of which their framework consists, and which, whilst the Sponge remains alive in water, is overspread with a thin layer of glairy semifluid matter. In many instances, the elasticity observed in the Common Sponge does not exist, an unyieldingness being imparted to the mass by the deposition in its interior of crystallized spicula of various form, consisting of calcareous or siliceous matter, corresponding in shape to the *raphides* observed in vegetable structures, and which exhibit determinate forms in different species. The whole surface of the Sponge is studded with innumerable and minute apertures which lead to canals in its interior, and these, gradually coalescing and forming larger and larger passages, terminate in cavities which open by large and commonly projecting orifices upon the surface of the Sponge. Through the minute orifices the water is absorbed into the Sponge, and is poured out of it in continuous streams by the large apertures. Locomotion does not belong to the Sponges; they are permanently fixed, excepting at their first production, when, according to Dr. Grant's statement, the gemmules from which they are generated are furnished with cilia, and capable of moving about in the water till they have selected a spot, where they attach themselves and remain throughout the rest of their existence.

LAMARCK has described one hundred and thirty-eight species of Sponges, to which the editors of the last edition of his great work, *Histoire Naturelle des Animaux sans Vertèbres*, have added nine; these he divides into seven sections:—1st. Sessile masses simple or lobed, forming either coverings or inclosures; 2nd. Subpediculate masses, or those contracted at their base, simple or lobed; 3rd. Pediculate masses, flattened or fan-shaped, simple or lobed; 4th. Concave expanded, cup-shaped or funnel-shaped masses; 5th. Tubular or pipe-shaped masses, not expanded; 6th. Foliaceous masses or divided into flattened lobes, leaf-shaped; and 7th. Branching, shrub or tree-like masses. Of these, however, some certainly are plants; and from the observations of Dr. Grant it is perfectly clear that among the others the types of three distinct genera are to be found, although it has not been hitherto possible to distribute the whole into their proper places, on account of the difficulty, and, in many instances, the impossibility, of obtaining the species in a recent state, in which only can its true structure be properly examined.

Whilst alive, the fibres of which the skeleton (as it may be called) of the Sponge consists, are everywhere covered with a transparent, soft, and even glutinous matter, which also spreads over the external surface, and lines the cavities, penetrating from the pores and fecal orifices into the interior, and it is in this soft matter that Lamarck considers the polyps of the Sponge reside, the existence of which, however, has not hitherto been ascertained.

It is to Dr. Grant we are indebted for a knowledge of the fact, that the fibres of which the skeleton consists are composed of three different kinds of materials, or rather, that of the three groups which he has at present discovered in Lamarck's genus *Spongia*, each group exhibits a difference of

structure and material in the composition of its skeleton, and hence he has divided them into the genera Sponges, Calcareous Sponges, and Siliceous Sponges, or, as they are called by Blainville, who retains the old generic name for the first, *Spongia*, *Calcispongia*, and *Halispongia*.

The species already determined to belong to this genus, as defined by Dr. Grant, are distinguished by a skeleton or axis, consisting of cylindrical, tubular, *horny* fibres, dissolving without effervescence in acids, leaving no trace when rubbed on glass, and, like burnt hair, emitting a horny odour: when examined beneath a microscope, they are shown as nearly of the same size, smooth externally, translucent, and of a brownish-yellow colour; tough, flexible, very elastic, generally quite straight, and anastomosing freely with each other. Their diameter is about a third of that of a human hair, one-half of which is occupied by their internal cavity, and they unite at a distance varying from one-tenth to a whole line, at all angles, dilating into small angular cavities, where they meet, and communicating freely with each other, so as to form one shut cavity throughout the whole Sponge, which, as they wind around the canals and pores, cannot therefore be the cells of any polyps or other animals causing the currents already mentioned. This part, the axis or skeleton, is that which is employed in commerce, or preserved in collections. But between all the fibres, when the Sponge is alive, there is another substance, soft and transparent, which readily putrifies and washes away after death, and it is probable that in it, if any where, is placed the residence of the animals by which the Sponge is formed.



Eagle and Snake.

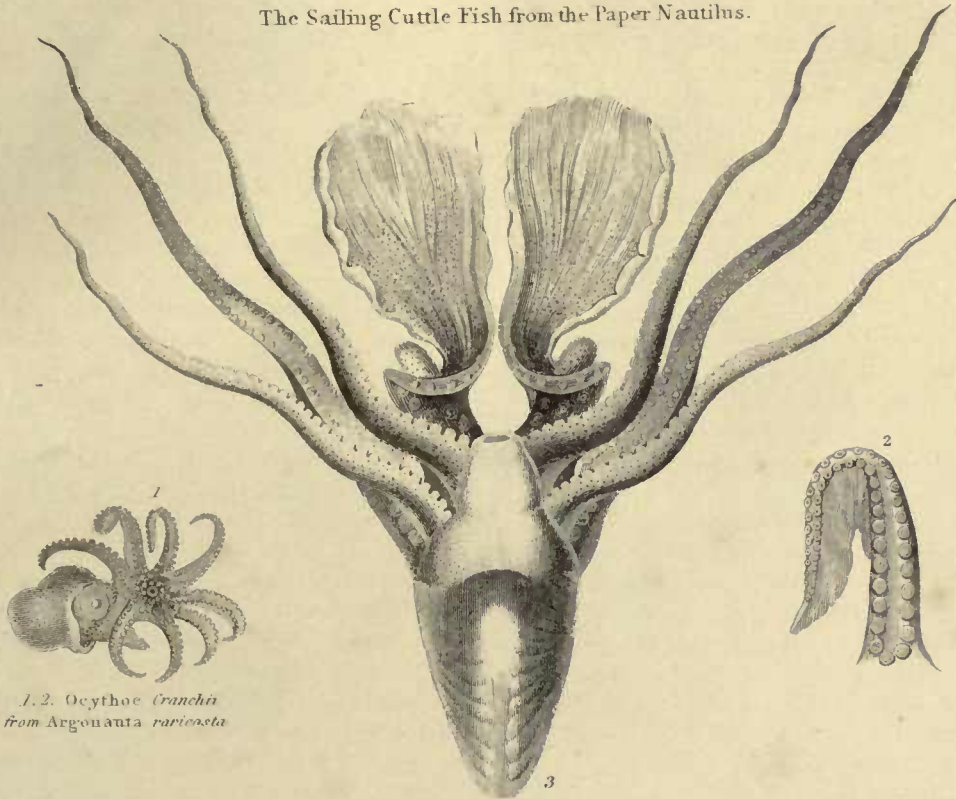
MOLLUSCA

Plate 1.

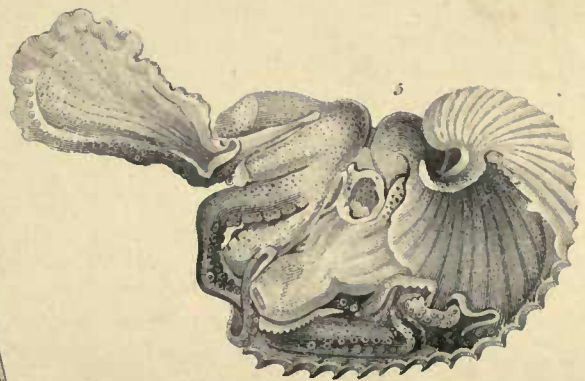
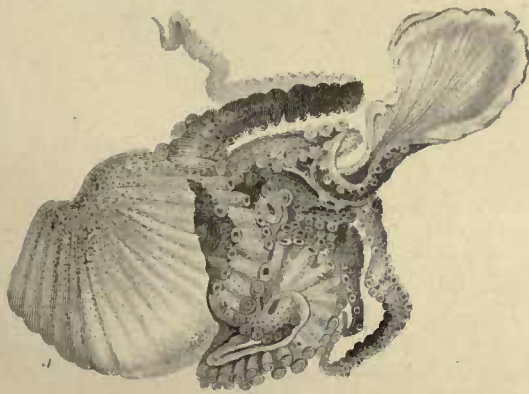
Class CEPHALOPODA.

Order OCTOPODA.

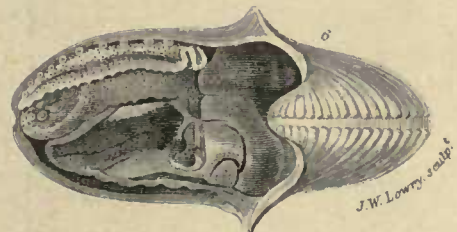
The Sailing Cuttle Fish from the Paper Nautilus.



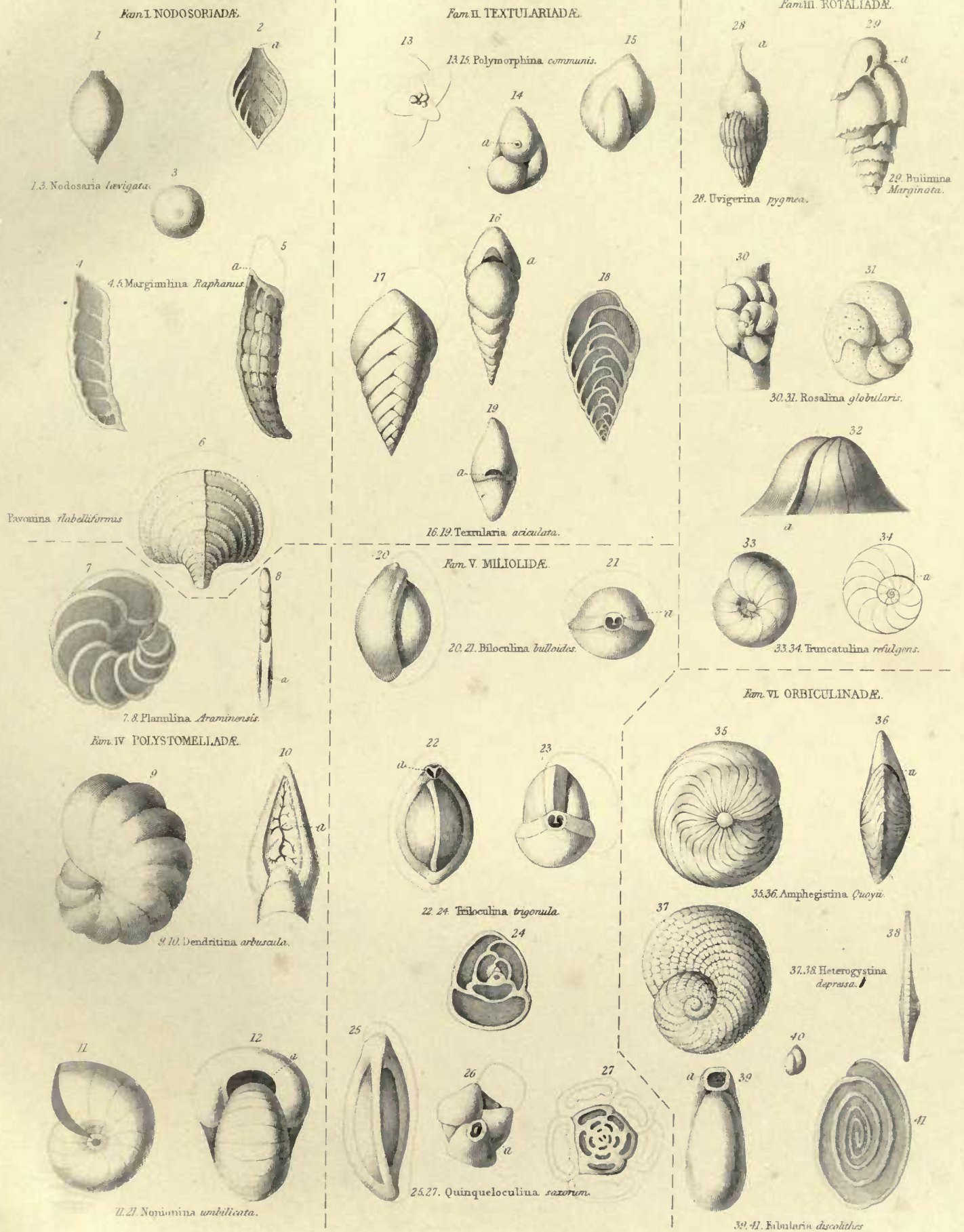
1. 2. *Ocythoe Cranchii*
from *Argonauta varicosta*



3. 8. *Ocythoe antiquorum*
from *Argonauta Argo*



1. The animal out of the shell. 2. the front arm showing the dilatation. 3. the animal expanded shewing the 8 arms the anterior pair being dilated at the end & the sides of the body marked by the ribs of the shell. 4. 5. the animal partly contracted. 6. the animal quite contracted in the shell. 7. 8. the side & top view of the animal partly contracted in its shell; the shell broken at the keel to shew the Eggs.



13. All these shells being very small they are all more or less magnified, in all the figures, *a* represents the mouth, and the dotted lines represent the theoretical form of the cells.

MOLLUSCA.

Class Gasteropoda. Order Pulmonifera.

Plate 3.

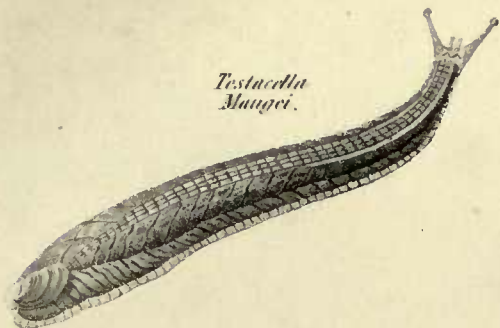
*Arion
Antiquorum.*



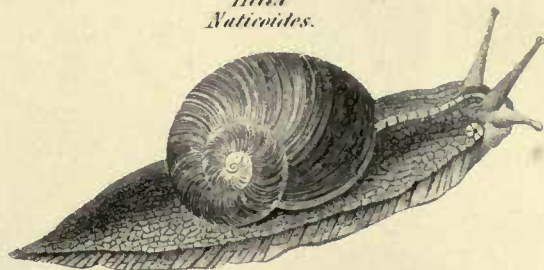
*Limax
Variegatus.*



*Testacella
Maugei.*



*Helix
Naticoides.*



H. Japonica.



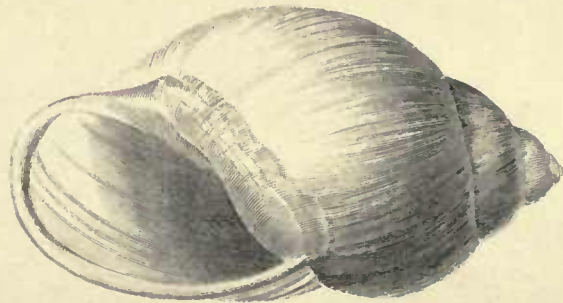
H. Algira.



H. Caracolla.



*Butimus
Ovatus.*



H. Albella.



*H. Xus
denticulata.*



H. Epistytium.



Pupa.



*Physa
rivalis.*



Clausilia.



*Achatina
virginica.*



Drawn by Miss Leary.

Engraved by J. W. Leary.

MOLLUSCA.

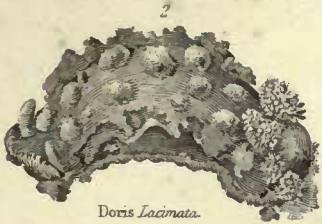
Class, LEPIDOPHORA.

Order, GYMNORANCHIA.

Family I. DORIDÆ.



Doris trilobata India.



Doris lacinata.

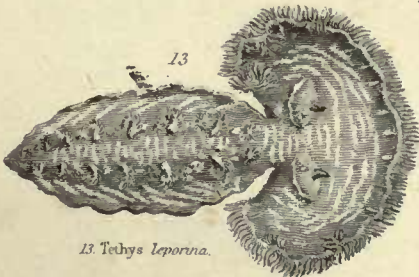


Doris nodosa.



Doris pennigera.

Fam. III. TRITONIADÆ.



Tritonia leporina.



Tritonia flammula.



Scyllaea pelagica.



Doris lombata.



Doris tuberculata.

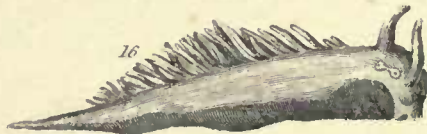


Doris cornuta.



Polycera quadricornis.

Fam. IV. EOLINÆ.



Eolida cuvieri.



Cavolina peregrina.

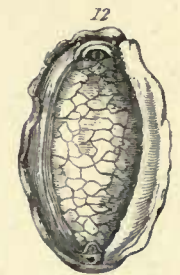
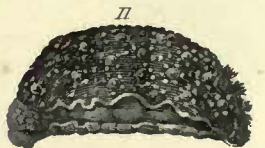


Eolis tergipes.

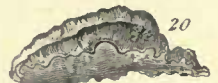
Fam. II. ONCHIDORINÆ.



Onchidorus leachi.

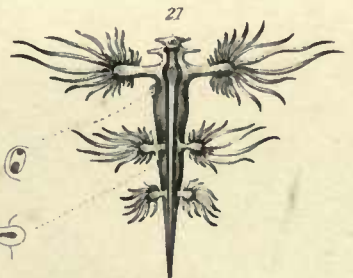


Peronia mauritiana.



Doris atromarginata.

Fam. V. GLAUCIDÆ.



Glaucus atlanticus.



Laniogerus fortii.



Class II *Cochleophora*

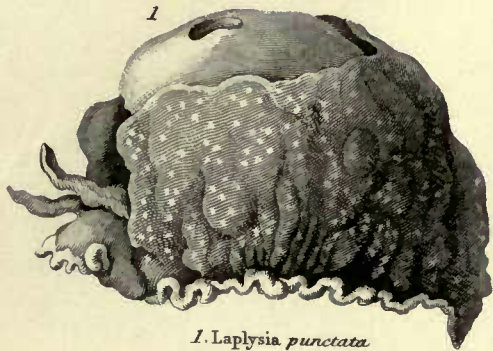
MOLLUSCA. III.

PLATE 5.

Order *Tectibranchiata*

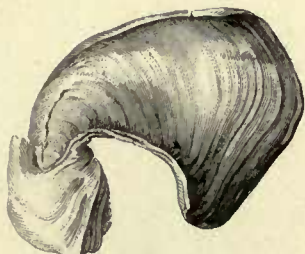
Family I. LAPLYSIADÆ. 1-3

1

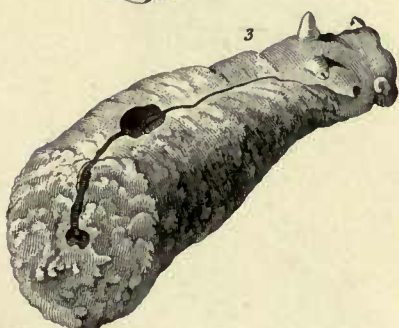


1. *Laplysia punctata*

2



3



2-3. *Dolabella Rumphii*

13



13. *Pleurobranchus Peronii*

14



13-15. *Lamellaria membranacea*

Family III. PLEUROBRANCHIDÆ. 13-15.

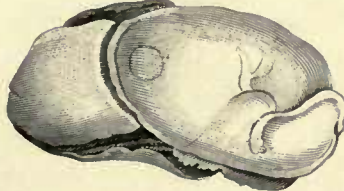
Family II. BULLIDÆ. 4-12

4



4-8. *Bullæa aperta*

6



6-7. *Bullæa lignaria*

9



9-11. *Bullina Guamensis*

10



11



12

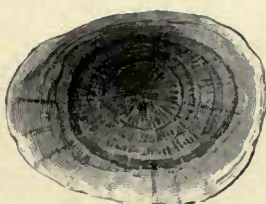


12. *Notarchus Cuvieri*

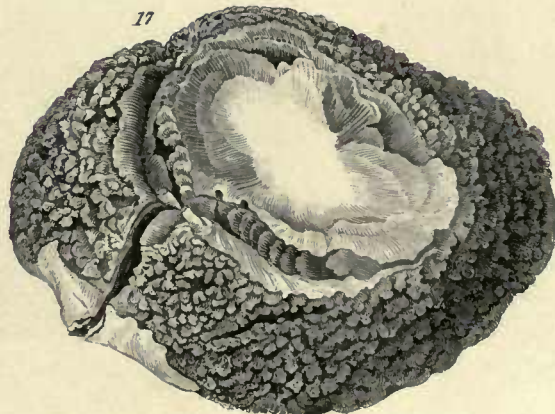
15



16



17



16-17. *Umbrella Indica*

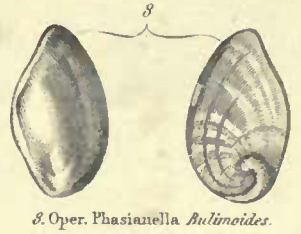
Family IV. UMBRELLIDÆ. 16-17

Class, COCHLEOPHORA.

MOLLUSCA.

Order, PTENOBANCHIA.

Family, I. TROCHIDÆ.



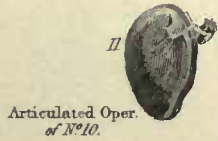
Trochus Henslowii.



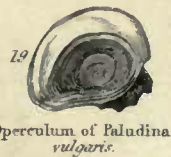
Trochus Emma.



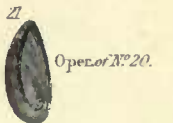
Fam. III. NERITADÆ.



Fam. IV. AMPULLARIADÆ.



Fam. V. CERITHIADÆ.



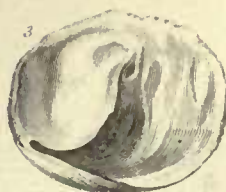
Family I. CREPIDULIDÆ.



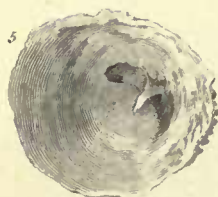
1, 2. *Crepidula porcellana*.



4. *Disputea birmanica*.



3. *Crepidula Peruviana*.



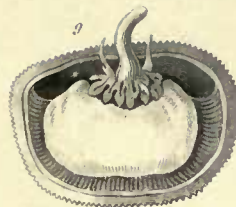
5, 6. *Calyptra Neptuni*.



7, 8. *Crepidula Unguis*.



Fam. II. CAPULIDÆ.



9, 12. *Capulus Hungaricus*.



13, 14. *Pileopsis mitula*.



15, 16. *Pileopsis crenulata*.

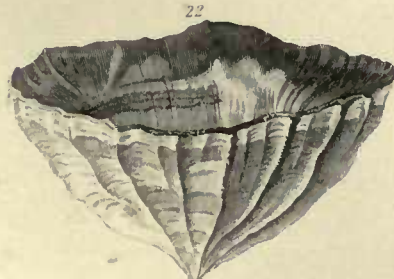


17, 19. *Hipponyx Cornucopiae*.

Fam. III. SIPHONARIADÆ.



20, 21. *Siphonaria radiata*.



22. *Siphonaria gigas*.



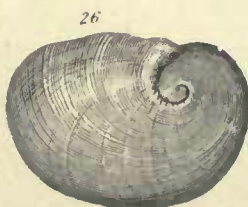
23, 24. *Gadina Alba*.



Fam. IV. CRYPTOSTOMIDÆ.



25



26

25, 26, 27. *Cryptostoma Haliotides*.



27

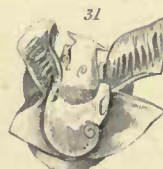
Fam. V. SIGARETIDÆ.



28, 31. *Sigaretus Haliotides*.



30



31



32. *Coriucella nigra*.



1 *Cynthia monus* Sav.



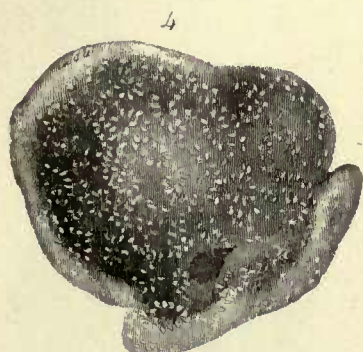
2,3 *Clavelina borealis*



7 *Cynthia canopus*



8,9 *Botryllus polyoides*



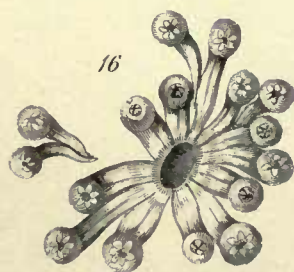
10-12 *Synoicum turgens*



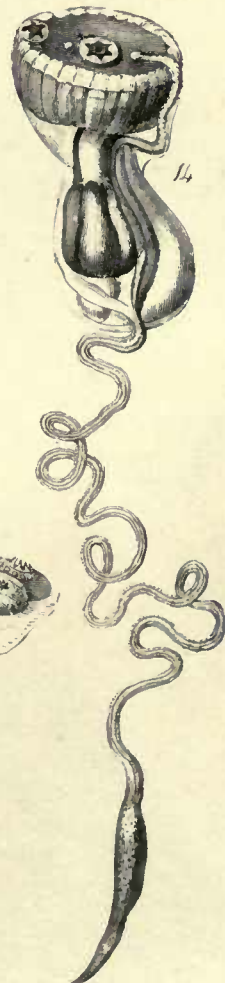
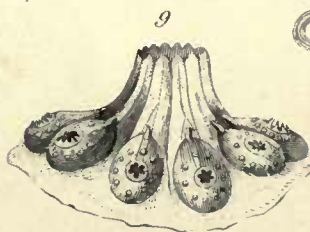
4-6 *Distoma rubrum* Sav.



13,14 *Sigillina australis*



15,17 *Polyclinum constellatum*



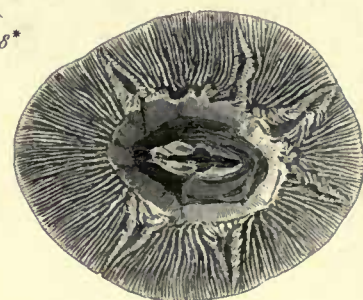
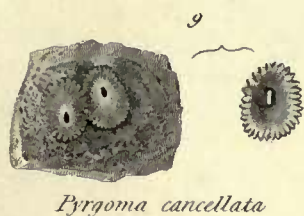
Class. CIRRIPEDES.

Plate 9.

Order. Campylosomata.



Order. Acamtosomata.

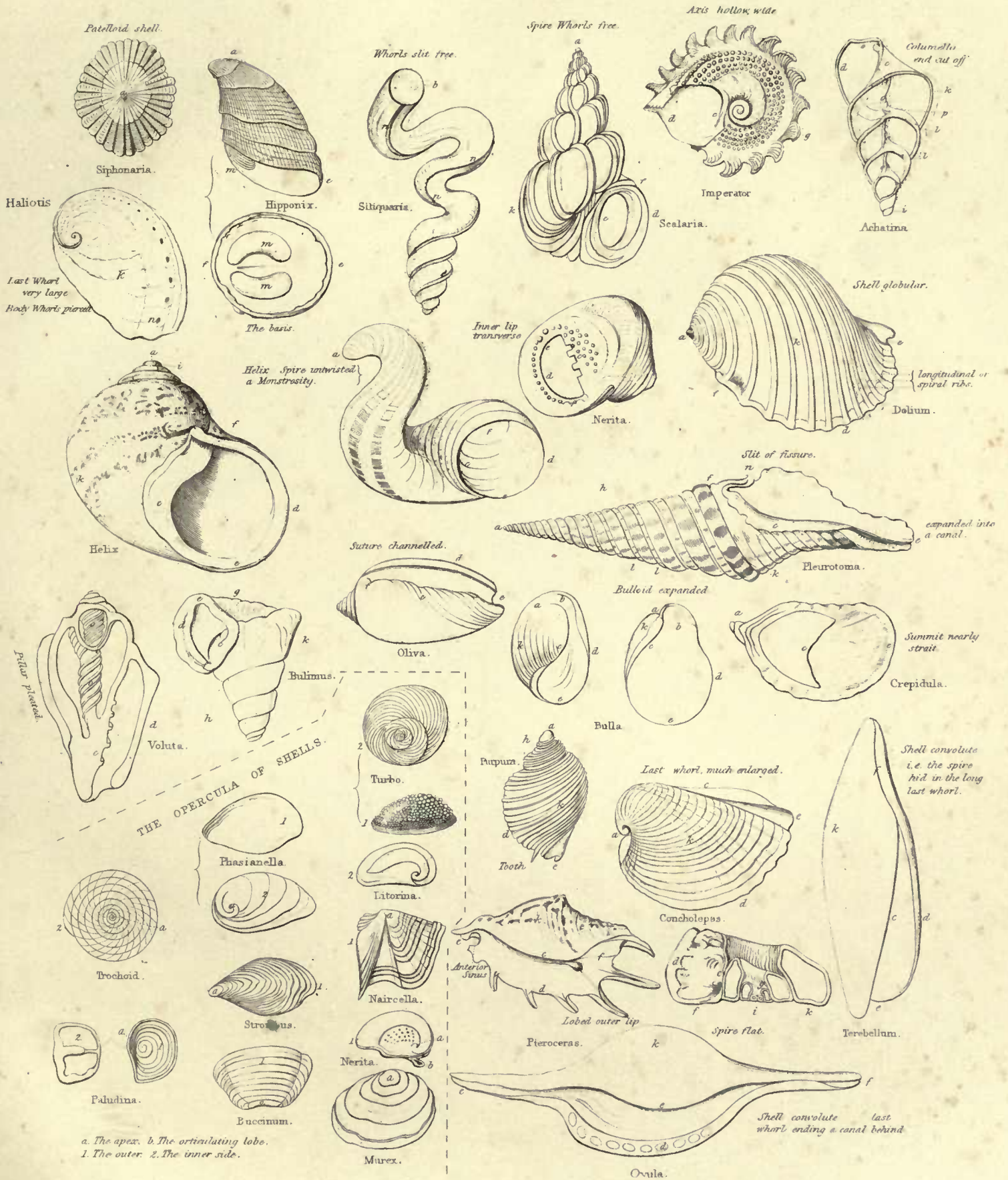


Drawn by Miss Lowry.

Engraved by J. W. Lowry.

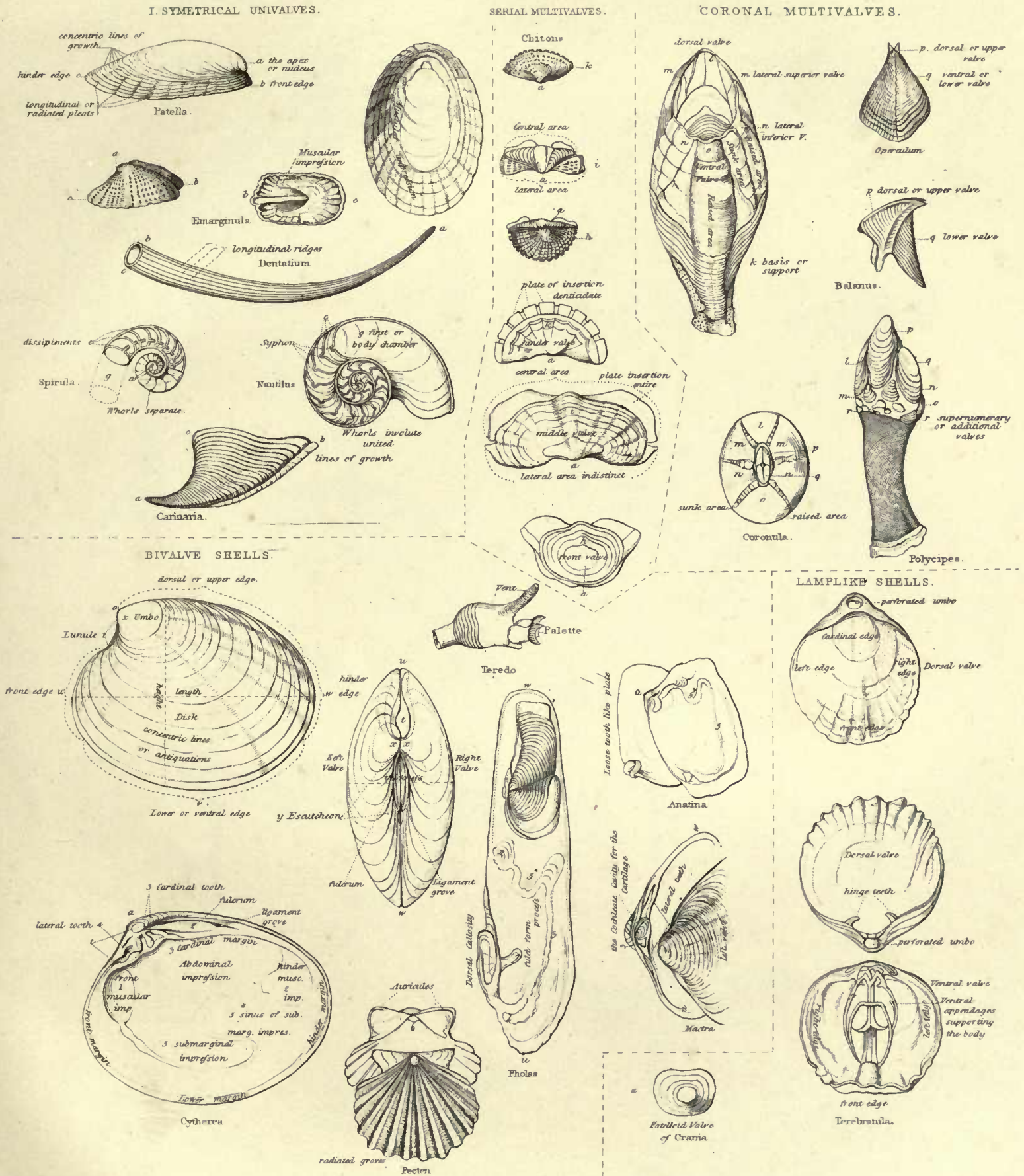
TERMS USED IN CONCHOLOGY.

SPIRAL OR SUBSPIRAL SHELLS.



N.B. a. Summit or nucleus, b. Margin of mouth or Peristome, c. The inner or columella lip, d. Outer lip, e. Front edge, f. Hinder edge of mouth, g. The hollow axis or umbilicus, h. Spire, i. First whorl, k. Body whorl, l. Suture, m. Muscular impression, n. Longitudinal slit, o. Columella, p. Dissepiment between the whorls.

THE TERMS USED IN CONCHOLOGY.



C. Pyne delin.

N. The Parts of the various shells having the same number or letter are similar.

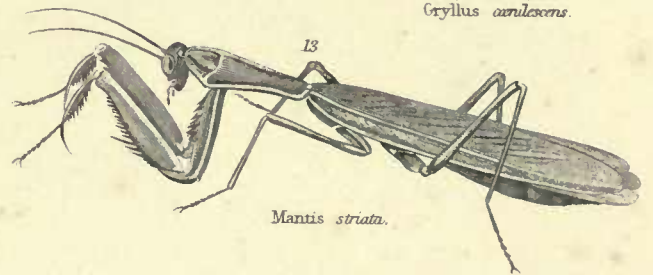
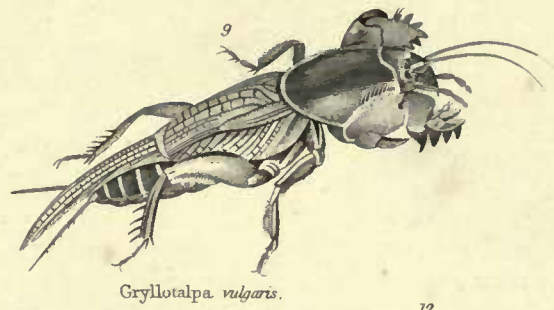
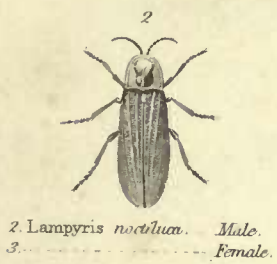
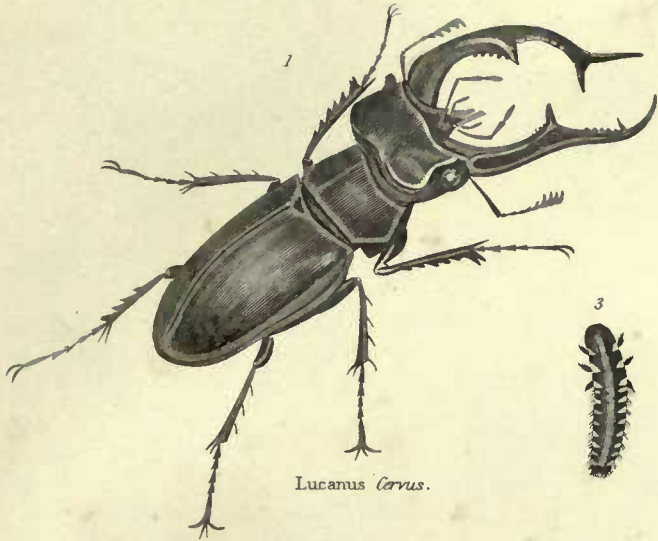
J.W. Lowry sculp.

INSECTA.

Class MANDIBULATA.

Order. COLEOPTERA.

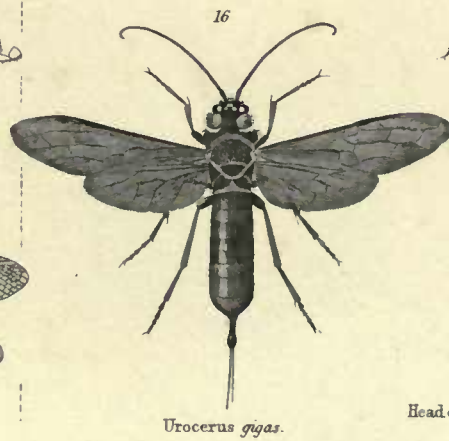
Order. ORTHOPTERA.



Order. NEUROPTERA.



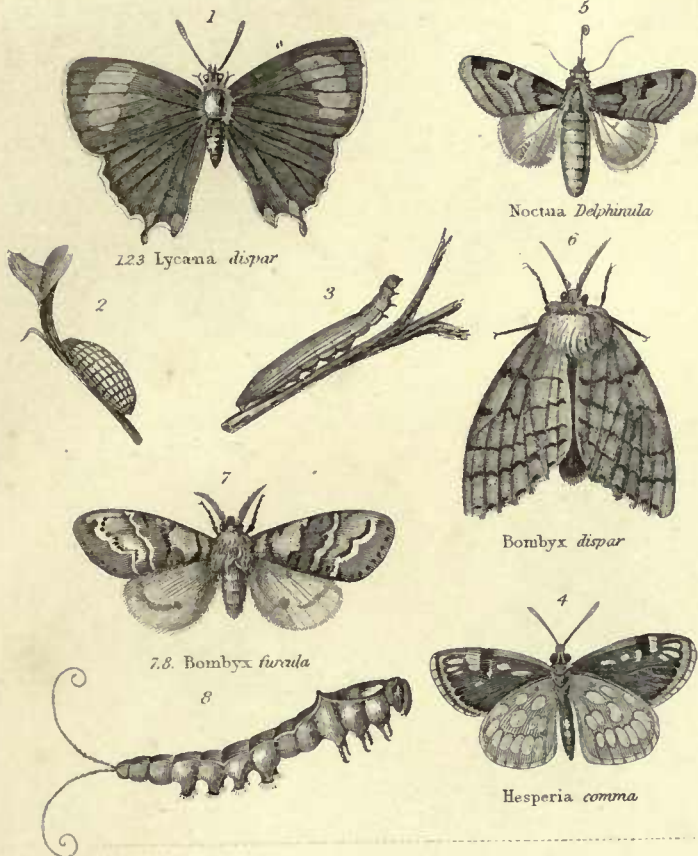
Order. HYMENOPTERA.



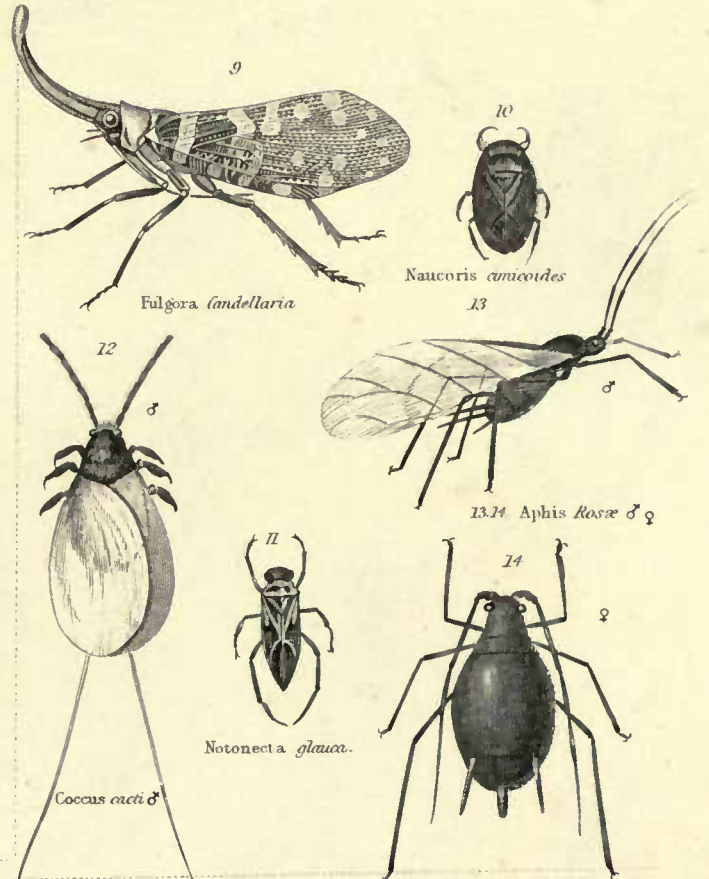
INSECTA.

Plate II.

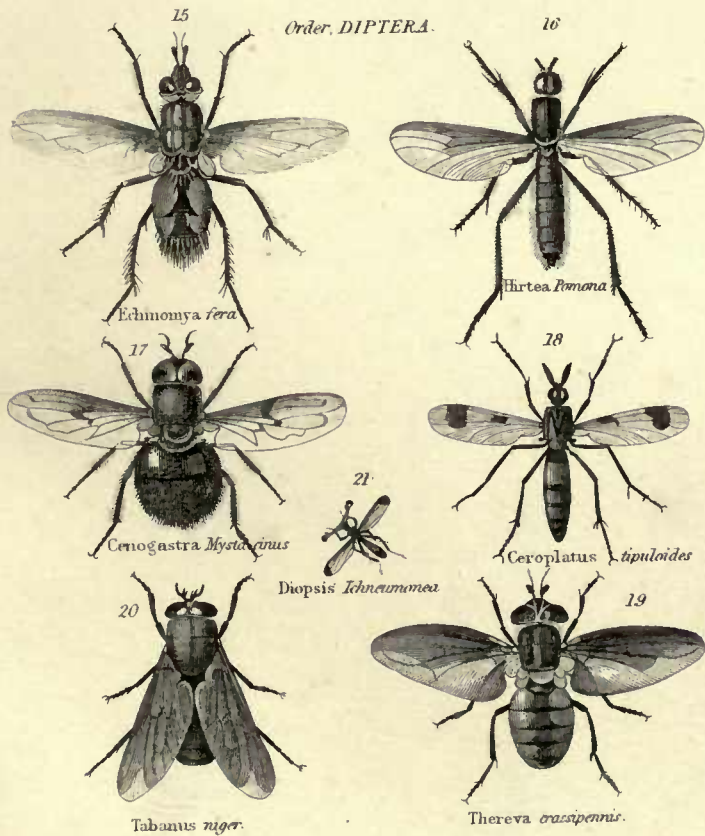
Class. HAUSTELLATA
Order. LEPIDOPTERA



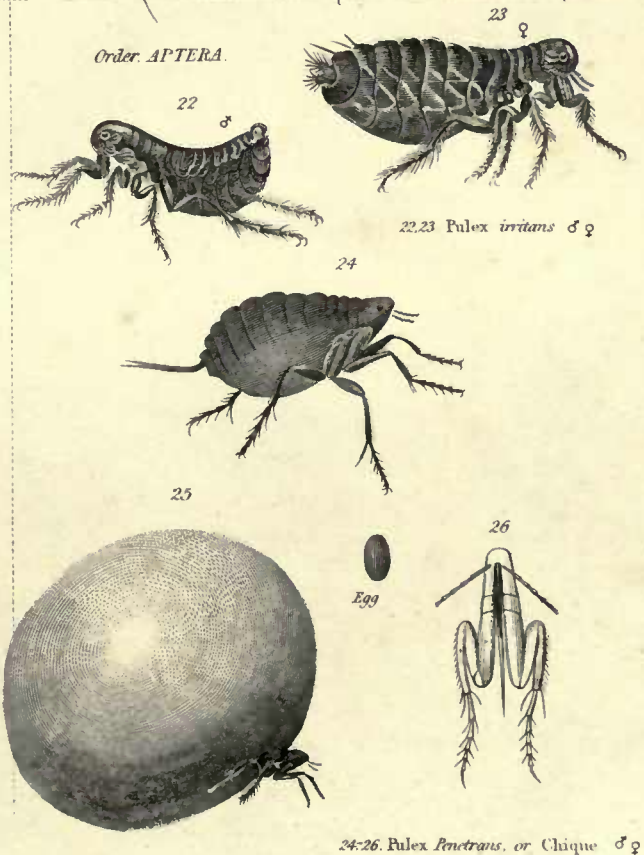
Order. HEMIPTERA.



Order. DIPTERA.



Order. APTERA.



J. W. Lowry sculp.

INSECTA.

Order COLEOPTERA.

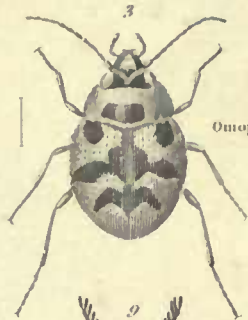
PLATE 3.



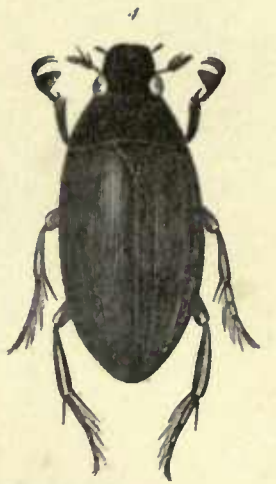
Anthia 4-guttata



Elaphrus uliginosus



Omophron limbatus



Hydrus piceus



Neerophorus requillo



Passalus interruptus



Drilus flavescens



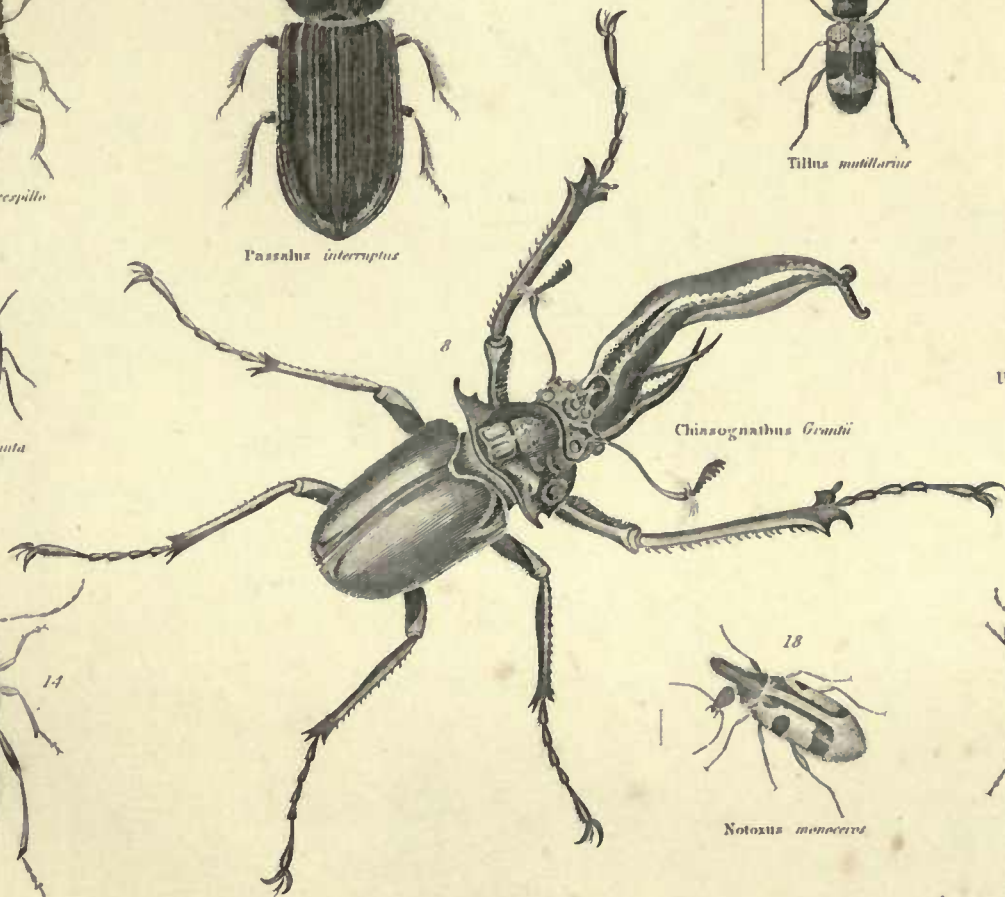
Tillus multicolor



Uleiota flavipes



Tachys minuta



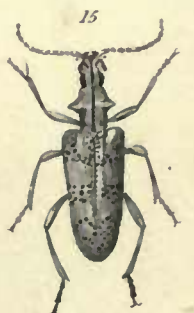
Chiasognathus Grandi



Molophilus abbreviatus



Notoxus monacrus



Rhagium mordax



Homalysus suturalis



Cerocoma Schelleri



Callichroma alpina



Enicospila alger



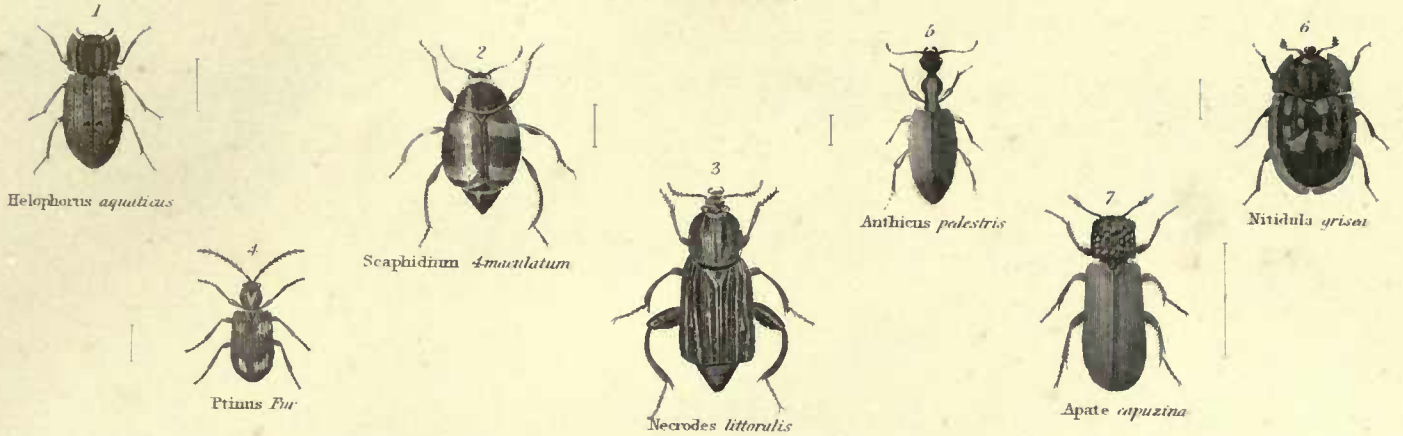
Lomechusa dentata

J.W. Levey sculp.

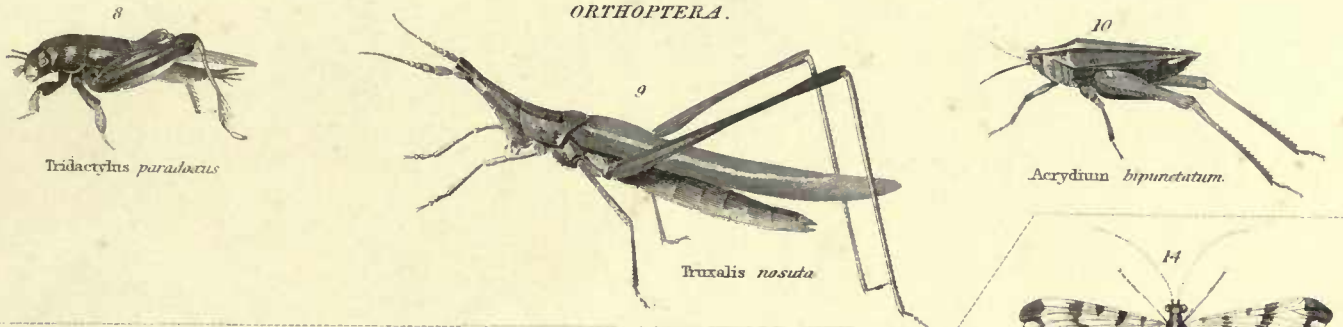
INSECTA.

PLATE 4.

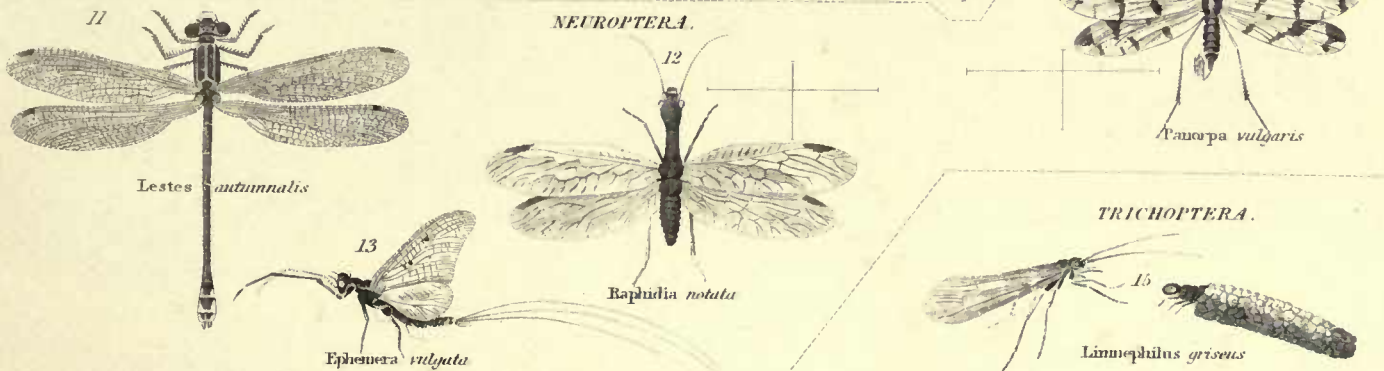
Order COLEOPTERA.



ORTHOPTERA.



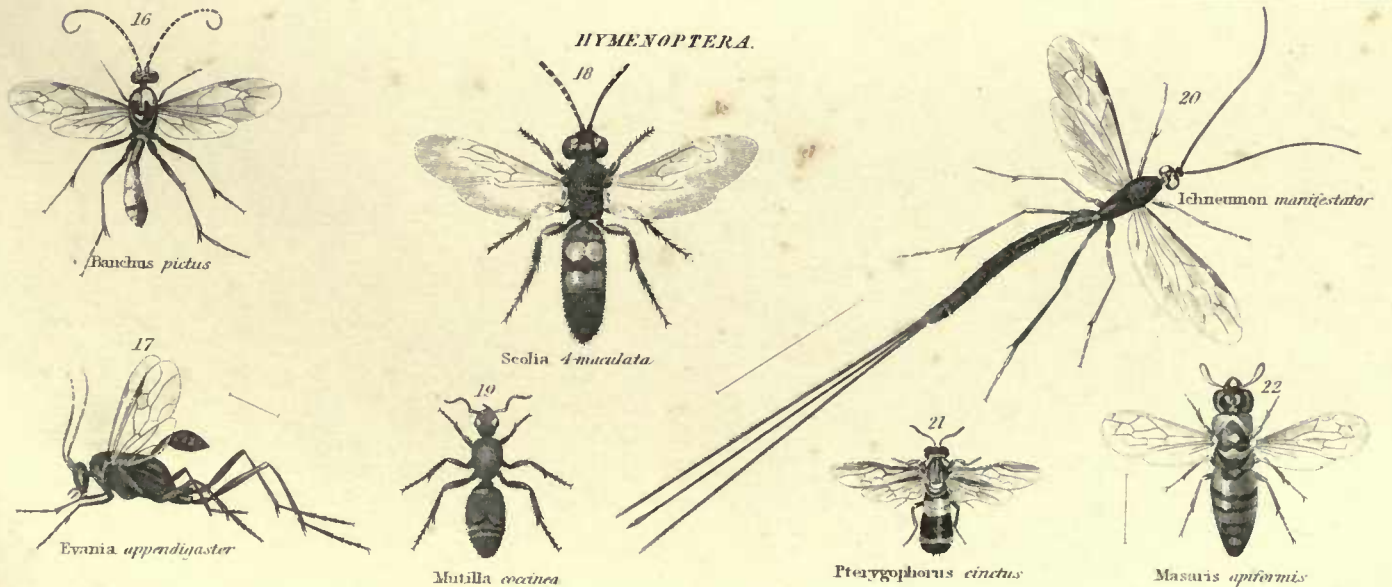
NEUROPTERA.



TRICHOPTERA.



HYMENOPTERA.



J.W. Lowry sculp.

INSECTA.

Order LEPIDOPTERA.

PLATE 5.



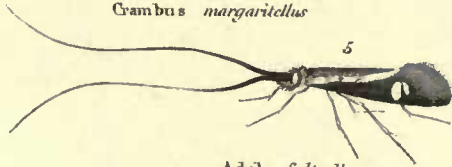
Fidonia melanaria



Earis clorana



Grambus margaritellus



Adela Sultzella



Harpiteryx harpella



DIPTERA



Ceria conopsoides



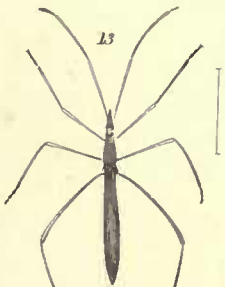
Henops marginatus



Anthrax Morio



Hydrometra staghorum



Berytus tipularius

HEMIPTERA



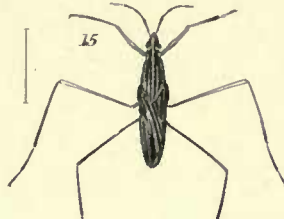
Imgis vinarum



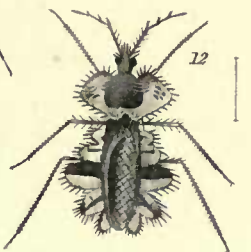
Lygaeus militaris



Tetyra nigrolineata



Gerris lacustris



Syrts paradoxus

HOMOPTERA



Lystra lanuginosa



Flata alba



Delphax pelucidus



Delphax dorsatus

STREPSIPTERA



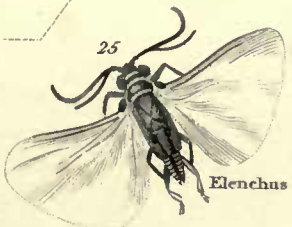
Thrips ceruleocollis



Stylops Melitte



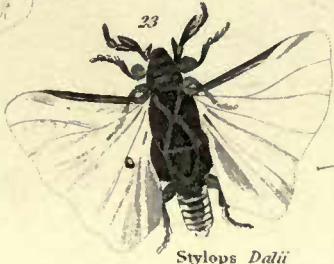
Stylops Kirbyi



Elenchus Walkeri



Haetophagus Curtisi



Stylops Dalii

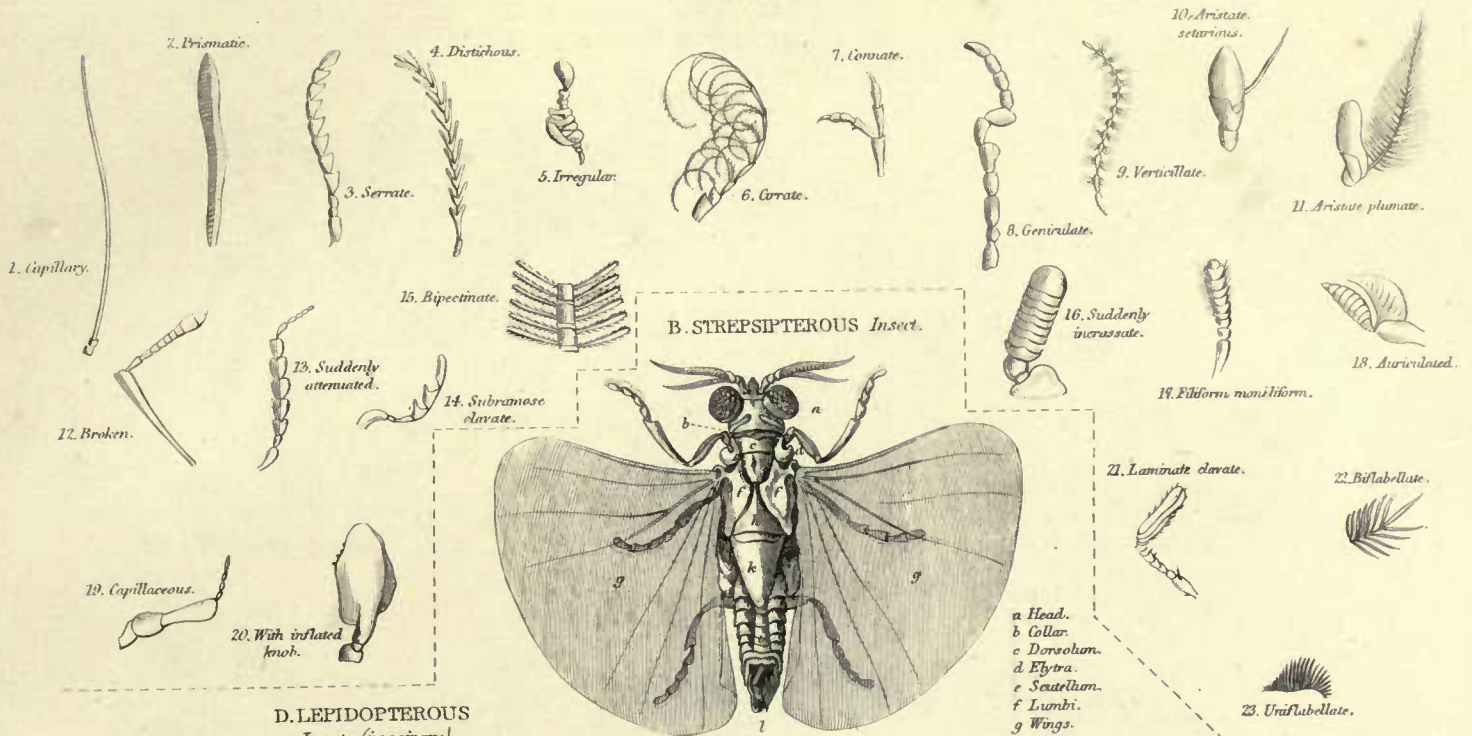


Xenos Vesparum

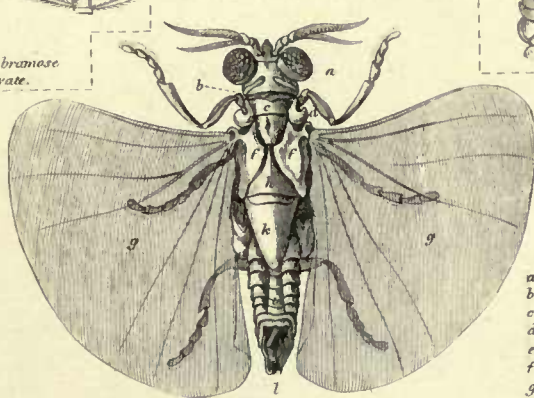
J.W. Leary, sculp.

TERMS USED IN ENTOMOLOGY.

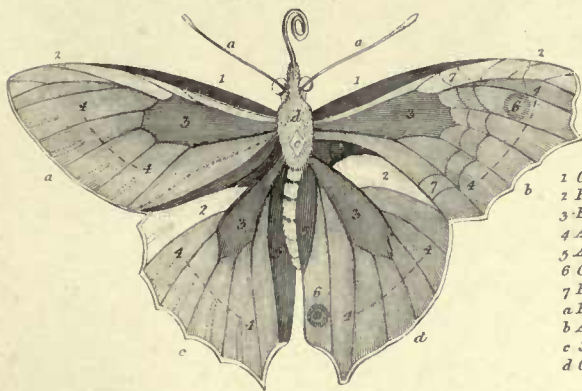
ANTENNÆ.



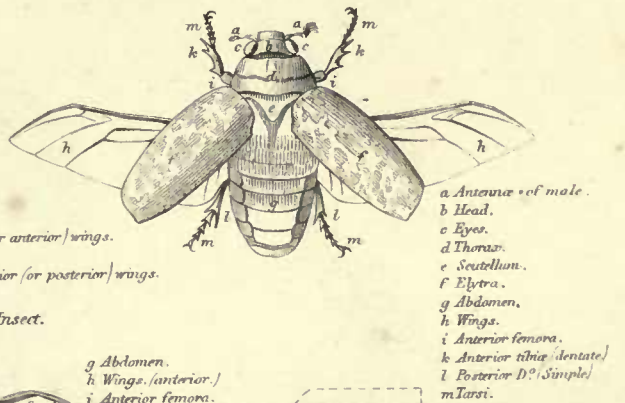
B. STREPSIPTEROUS Insect.



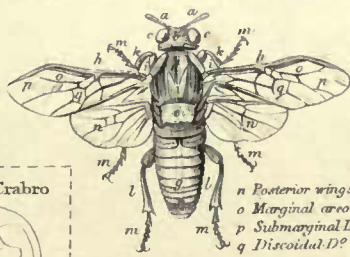
D. LEPIDOPTEROUS Insect (imaginary)



A. COLEOPTEROUS Insect.



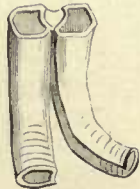
C. HYMENOPTEROUS Insect.



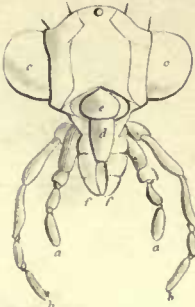
1. Lepidoptera.

a Palpi
b Antlia
c Eye

2. Part of Antlia magnified.

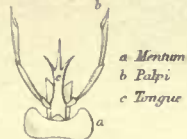


3. Head of Trichoptera.



TROPHI &c.

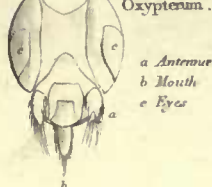
5. Labrum of Leistus



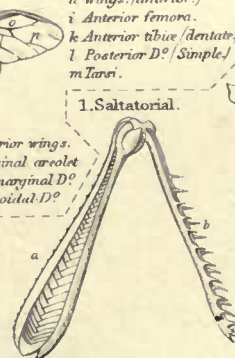
4. Head of Crabro



6. Head of Oxypterum.



1. Saltatorial.



LEGS.

5. Simply dilated tarsus.



3. Fossorialis.



J.W. Lowry sculp.

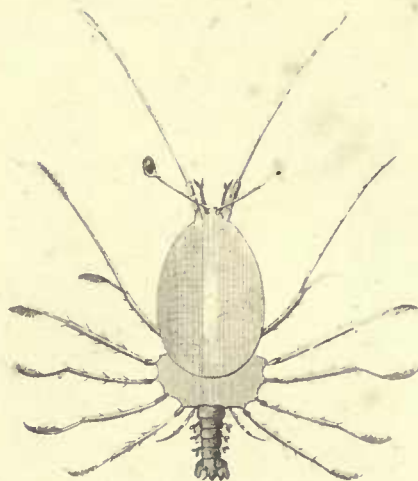
CRUSTACEA

Family I. BRACHYURA

1



Grapsus pictus



Phyllosoma clavirostris

Family II. MACROURA

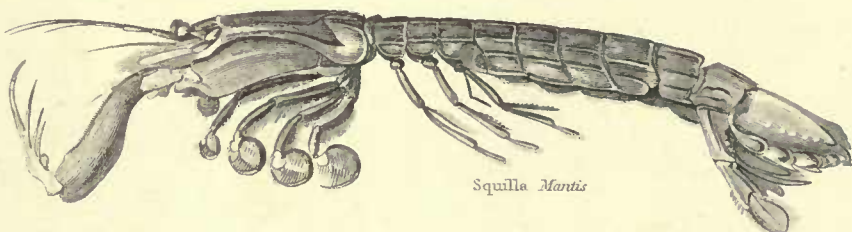
3



Pagurus Bernardus

Family III. STOMATOPODA

4



Squilla Mantis

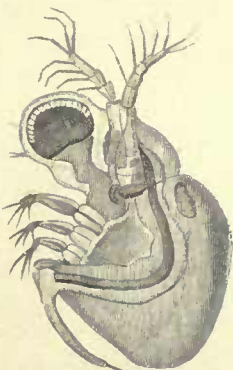
Family IIII. ISOPODA

5



Cynodoce Lamarckii

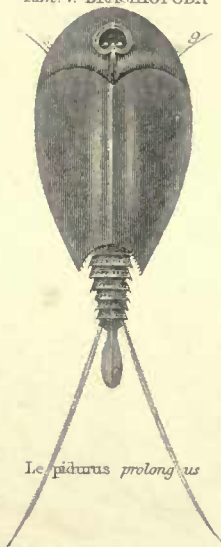
7



Polyphemus stagnalis

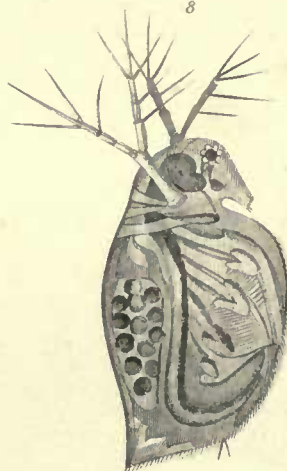
Family V. BRACHIOPODA

9



Lepidurus prolongus

8



Daphnia Pulex

6



Porcellus asellus

10



Brachypus stagnalis

ARACHNIDÆ.

Family I. THYSANOURA.



Forficina vittata.

Family II. PARASITICA.



Ricinus pavoris.



Pediculus humanus.



3 a



Podura villosa.

Family III. MYRIAPODA.



Polydesma complanata.



Lithobius vulgaris.



Glomeris zonatus.



7 a



Julus sabulosus.

Family IV. ACARI.



Smaridia fringillaris.



10



10 a

Siro rubens.



Mygale avicularis.

Family V. ARANEÆ.



Aranea extensa.



Aranea lobata.



Scorpio rufescens.

Family VI. CHELIFERÆ.

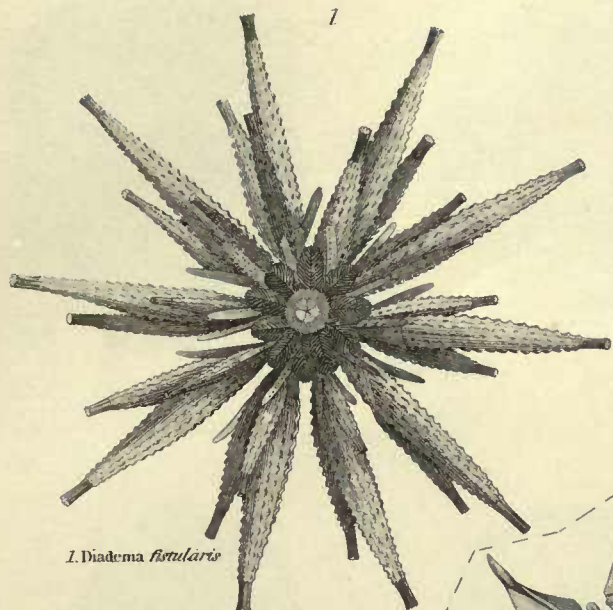


Chelifer cancriformis.

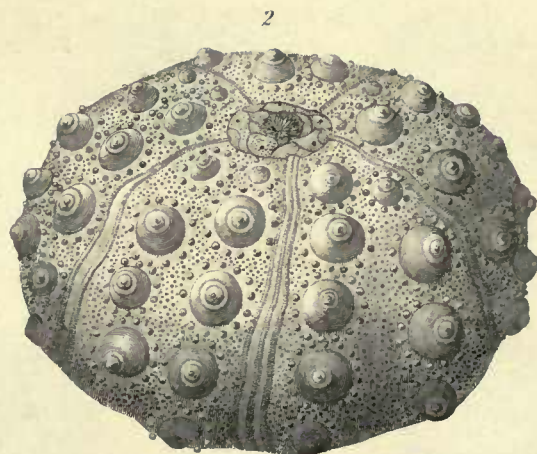
ECHINODERMATA.

PLATE 1

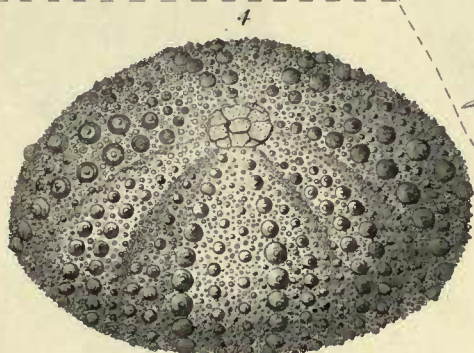
Family I. CIDARIDE.



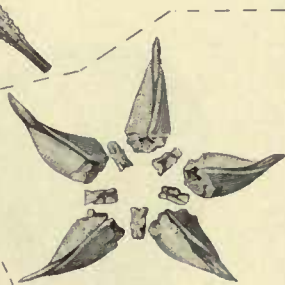
1. *Diadema fistularis*



2. *Cidaris imperialis*



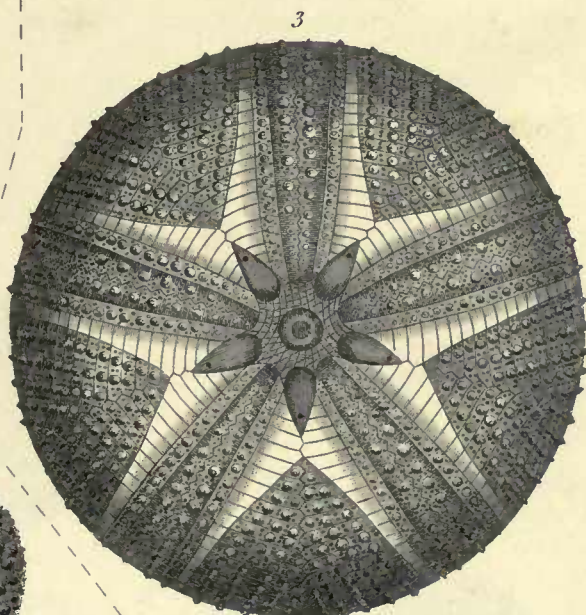
4. *Echinus miliaris*



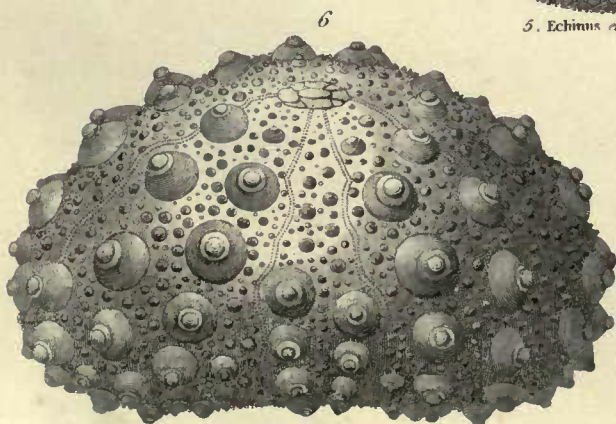
5



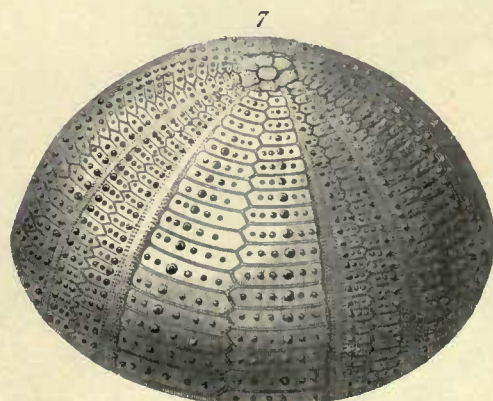
5. *Echinus elegans*



3. *Astropyga radiata*



6. *Echinometra mammillatus*



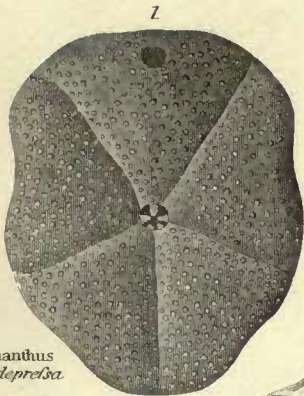
7. *Echinus sahidicus*

Family II. ECHINIDÆ.

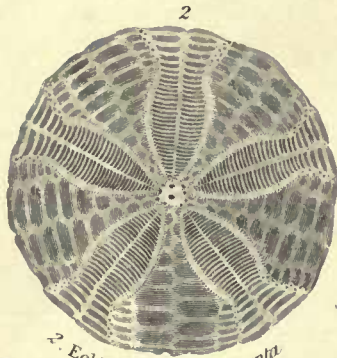
ECHINIDA. 2

PLATE 2.

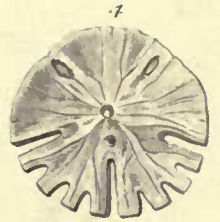
Family 3. SCUTELLIDÆ



1. *Echinanthus subdepressa*



2. *Echinarachnius Placenta*



3 & 4. *Echinodiscus digitata*



5. Jaws of *Echinanthus rosaceus*



6. Jaws of *Echinodiscus serratoris*

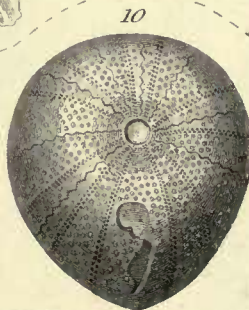


7 & 8. *Catidulus australis*

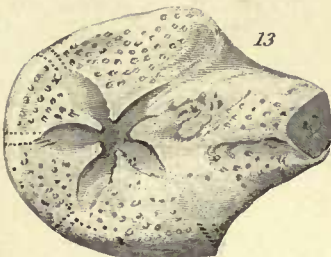
Family 4. GALERITIDÆ



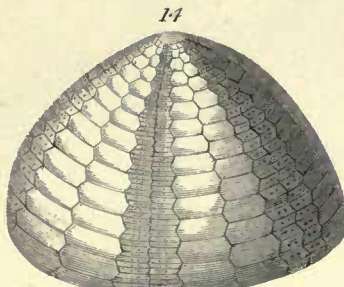
9 & 10. *Galerites albo galerus*



11 & 12. *Echinanus minor*



13. *Echinolampas koenigii*

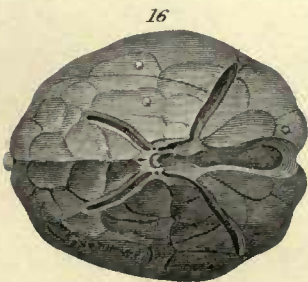


14. *Echinocorys ovatus*

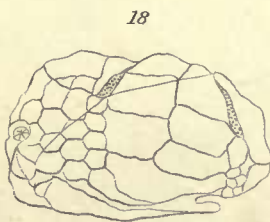


15. *Echinobrissus bryonii*

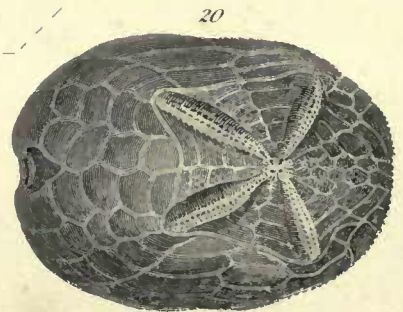
Fam. 5. SPATANGIDÆ



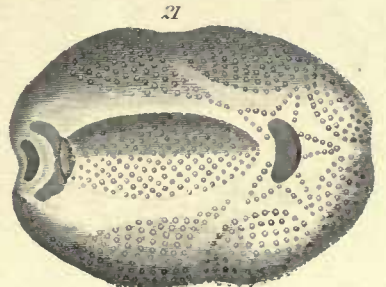
16, 17 & 18. *Echinodardium atropos*



19. Tentacula of *Spatangus purpureus*

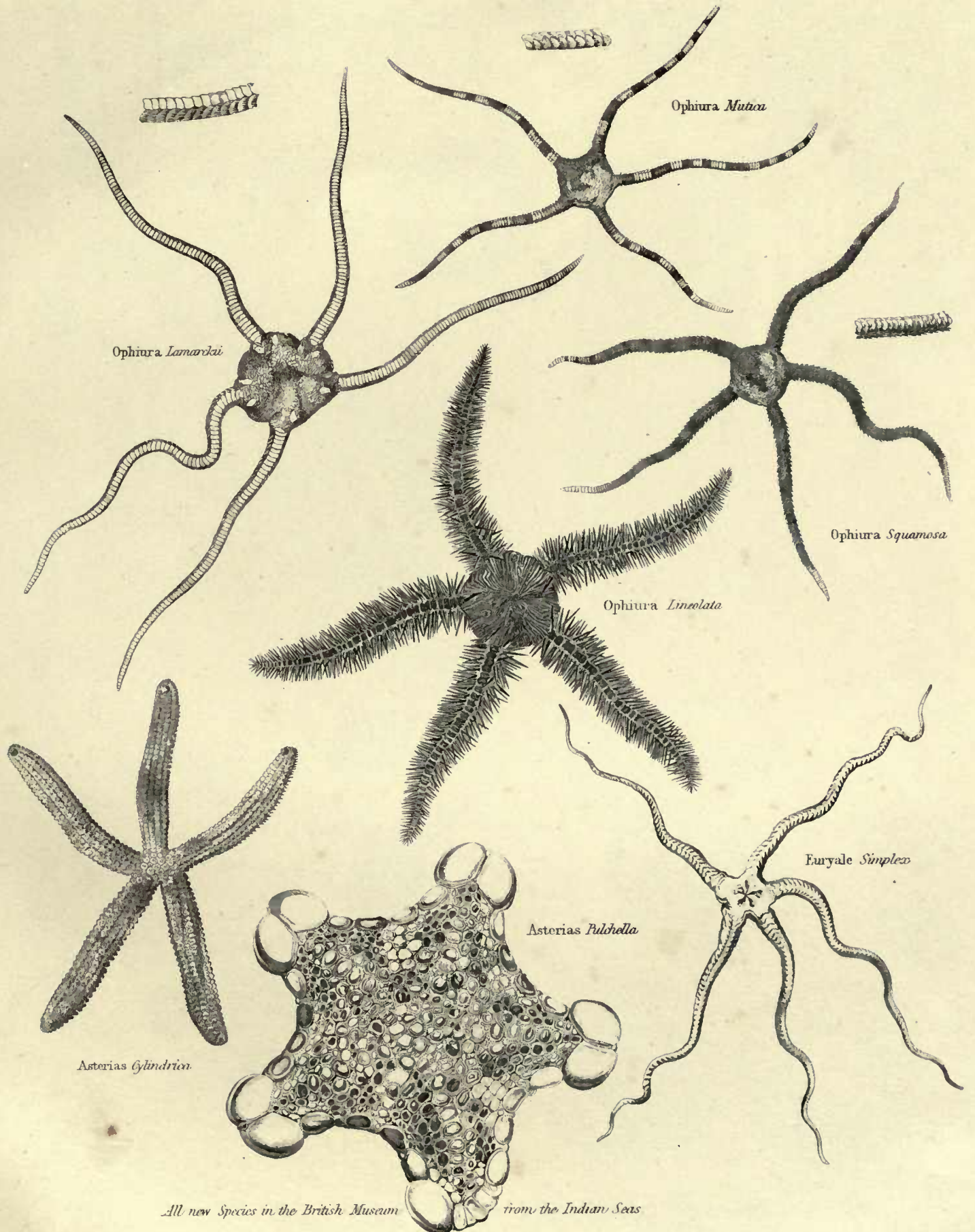


20 & 21. *Britus unicolor*



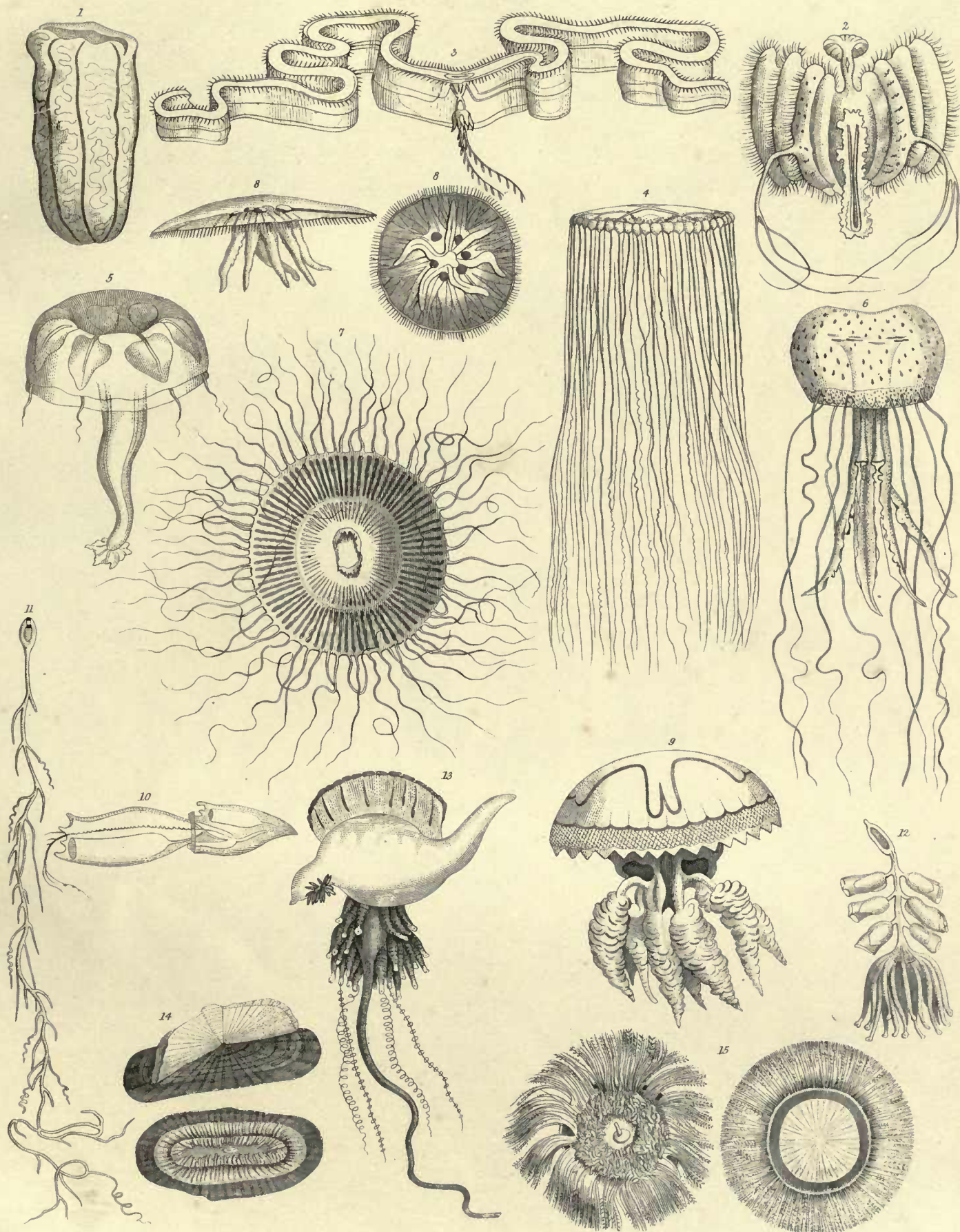
RADIATA.

PLATE 3.
Class STELERIDA



All new Species in the British Museum from the Indian Seas

ACALEPHÆ.



C.R. Bono delin.

J.W. Lowry sculp.

1. *Beroë macrostoma*. 2. *Callianira triptoptera*. 3. *Cestum Veneris*. 4. *Berenice rosea*. 5. *Geryonia hexaphylla*.
 6. *Pelagia panopyra*. 7. *Eurecea forskaelina*. 8. *Aurelia aurita*. 9. *Rhizostoma Cuvieri*. 10. *Diphya*.
 11. *Rhizophysa planostoma*. 12. *Physophora disticha*. 13. *Physalia megalista*. 14. *Veella cyanea*. 15. *Brpita gigantea*.

INFUSORIA.

PLATE 1

Order: Polygastrica.

Fam. Aenetera-Enterodola.



Genera & Species.

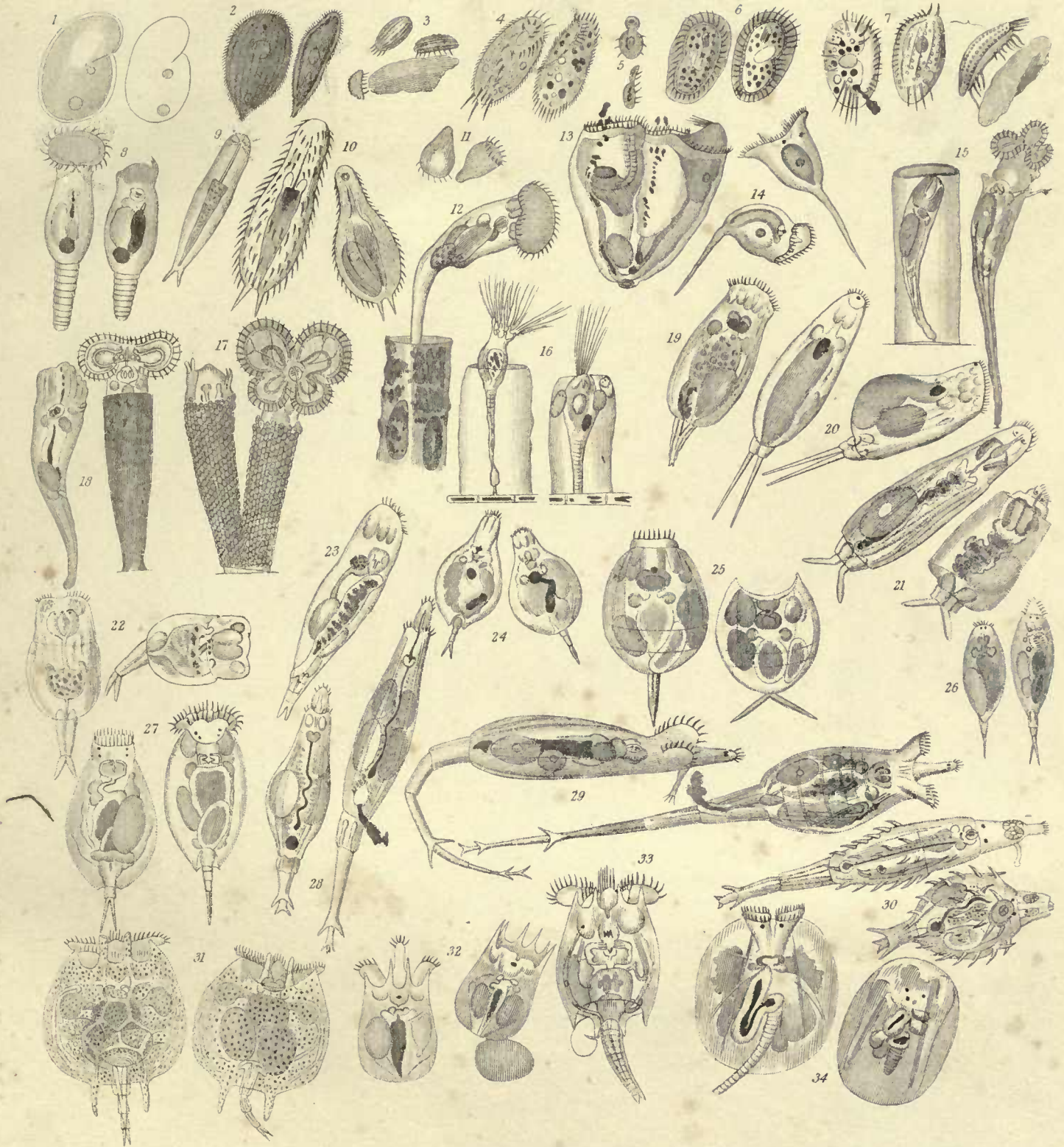
1. Monas, <i>Gygnasium</i> .	11. Spherosira, <i>Volvox</i> .	21. Amoeba, <i>Dirrhina</i> .	31. Synedra, <i>Ulna</i> .	41. Glenodinium, <i>Taludatum</i> .	51. Leucophrys, <i>Patula</i> .
2. Monas, <i>Guttula</i> .	12. Volvox, <i>Globator</i> .	22. Diffugia, <i>Proteiformis</i> .	32. Echinella, <i>Splendida</i> .	42. Stentor, <i>Mulleri</i> .	52. Parodon, <i>Teres</i> .
3. Uvella, <i>Virescens</i> .	13. Vibrio, <i>Subtilis</i> .	23. Cyphidium, <i>Aureolum</i> .	33. Synecchia, <i>Salpa</i> .	43. Urocentrum, <i>Turbo</i> .	53. Coleps, <i>Incurvus</i> .
4. Domoecus, <i>Globulus</i> .	14. Spirodiscus, <i>Fulvus</i> .	24. Desmidiium, <i>Swarzii</i> .	34. Naumena, <i>Dikynii</i> .	44. Vorticella, <i>Microstoma</i> .	54. Trachelius, <i>Ovum</i> .
5. Chilomonas, <i>Volvox</i> .	15. Closterium, <i>Lunula</i> .	25. Xanthidium, <i>Fasciculatum</i> .	35. Schizonema, <i>Agardhi</i> .	45. Zoothamnium, <i>Arbuscula</i> .	55. Phialina, <i>Vannicularis</i> .
6. Bodo, <i>Socialis</i> .	16. Astasia, <i>Hematodes</i> .	26. Micrasterias, <i>Boryana</i> .	36. Cyclidium, <i>Glaucoma</i> .	46. Oplrydium, <i>Feratile</i> .	56. Chilodon, <i>Gucululus</i> .
7. Cryptomonas, <i>Ovata</i> .	17. Englena, <i>Furidis</i> .	27. Euastrum, <i>Auleatum</i> .	37. Chetomonas, <i>Constricta</i> .	47. Tintinnus, <i>Inquilinus</i> .	57. Nassula, <i>Elegans</i> .
8. Trachelomonas, <i>Follicula</i> .	18. Distigma, <i>Tenax</i> .	28. Navicularia, <i>Phaniceron</i> .	38. Chetophyla, <i>Armata</i> .	48. Vaginicola, <i>Crystallina</i> .	58. Trachelocerca, <i>Olor</i> .
9. Gyges, <i>Granulum</i> .	19. Epipyxis, <i>Utriculus</i> .	29. Bacillaria, <i>Vulgaris</i> .	39. Chetoglena, <i>Volvocina</i> .	49. Euchelys, <i>Pupa</i> .	59. Amphileptus, <i>Fasciola</i> .
10. Syncrypta, <i>Volvox</i> .	20. Dinobryon, <i>Sertularia</i> .	30. Isthmia, <i>Enervis</i> .	40. Peridinium, <i>Tripes</i> .	50. Lachrymaria, <i>Proteus</i> .	60. Aspidisca, <i>Denticulata</i> .

Order Polygastrica, Figs 1 to 7.
 Rotatoria, — 8 to 34.

INFUSORIA.

Fam. Enterocela, Figs 1 to 7
 Monotrocha, Sorotrocha, — 8 to 34

PLATE 2



GENERA AND SPECIES.

- | | | | |
|---------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 1. Kolpoda, <i>Rim</i> . | 8. Pygura, <i>Melicerta</i> . | 15. Tubicolaria, <i>Najas</i> . | 22. Trophthalmus, <i>Dorsualis</i> . |
| 2. Ophryoglena, <i>Acuminata</i> . | 9. Ichthyidium, <i>Podura</i> . | 16. Floucularia, <i>Ornata</i> . | 23. Cycloglena, <i>Lupus</i> . |
| 3. Oxytricha, <i>Acuda</i> . | 10. Chironotus, <i>Mucronatus</i> . | 17. Melicerta, <i>Rinocer</i> . | 24. Lepadella, <i>Oralis</i> . |
| 4. Stylonychia, <i>Pustulata</i> . | 11. Glenophora, <i>Trochus</i> . | 18. Limnias, <i>Gratophylli</i> . | 25. Euchlanis, <i>Luna</i> . |
| 5. Discocephalus, <i>Rotatorius</i> . | 12. Existes, <i>Hyalinus</i> . | 19. Hydatina, <i>Brachydactyla</i> . | 26. Colurus, <i>Caudatus</i> . |
| 6. Chlamydodon, <i>Mnemocyme</i> . | 13. Cyphonautes, <i>Compressus</i> . | 20. Fuencularia, <i>Gibba</i> . | 27. Squamella, <i>Oblonga</i> . |
| 7. Euplotes, <i>Thuron</i> . | 14. Microcodon, <i>Clavus</i> . | 21. Diglena, <i>Grandis</i> . | 28. Callidina, <i>Elegans</i> . |
| | | | 29. Rotifer, <i>Macrurus</i> . |
| | | | 30. Philodina, <i>Aculeata</i> . |
| | | | 31. Notoz, <i>Quadricornis</i> . |
| | | | 32. Anuraea, <i>Squamula</i> . |
| | | | 33. Brachionus, <i>Amphiceros</i> . |
| | | | 34. Perodina, <i>Patina</i> . |

POLYPS.

Class I. CORALS. ZOOPHYTARIA.



1. *Cornicularia rugosa*.



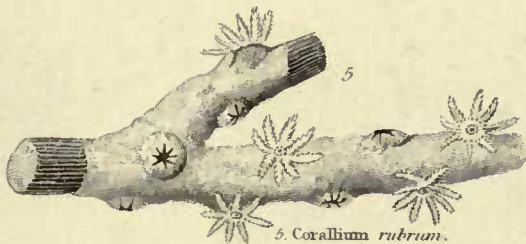
2. *Tubipora musica*.



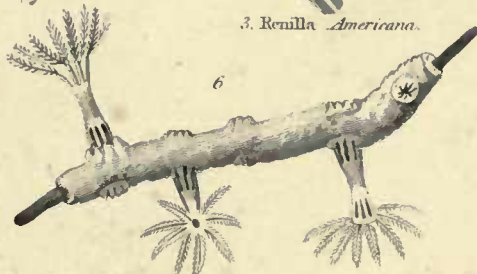
3. *Renilla Americana*.



4. *Tubularia Urtica*.



5. *Corallium rubrum*.

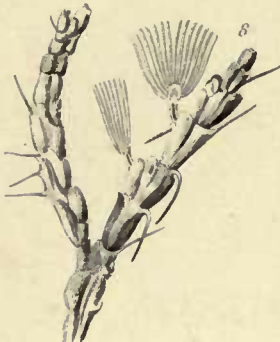


6. *Gorgonia patula*.

II. POLYPS & POLYPARIA



7. *Millipora spongitis*.



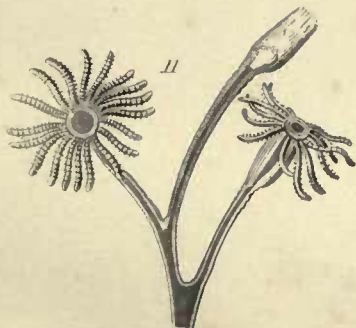
8. *Bicellaria fastigiata*.



9. *Seriataria longidens*.



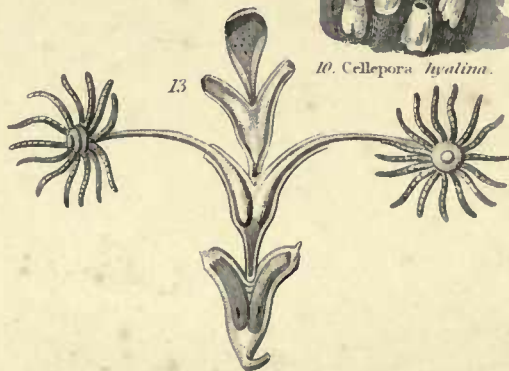
10. *Cellepora hyalina*.



11. *Laomedea dichotoma*.



12. *Hammaria secundaria*.



13. *Sertularia pumila*.

III. SEA FLOWERS & STAR - CORAL. ZOANTHARIA.



14. *Caryophyllaea solitaria*.



15. *Meandrina limesa*.



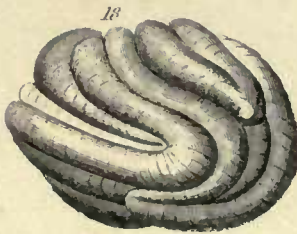
16. *Zoanthus Ellisii*.



17. *Astrea Ananas*.



19. *Oculina varicosa*.



18. *Meandrina caribbeensis*.



19. *Oculina varicosa*.



20. *Actinia dianthus*.

INDEX OF SCIENTIFIC NAMES.

- ACALEPIA, 150.
 Acamptosomata, 137.
 Acanthopterygia, 110.
 Acarida, 147.
 Acasta, 138.
 Accipetres, 58.
 Accipenser, 125.
 — Ruthenus, 125.
 — Sturio, 125.
 Acephala, 135.
 Acera, 133.
 Achatina, 131.
 Acrochordus, 104.
 — Javanensis, 104.
 Acrydium, 143.
 Actinea, 154.
 Adela, 144.
 Ageneiosis, 118.
 Aholata, 109.
 Alauda, 68.
 — Arborea, 68.
 — Arvensis, 68.
 Alca, 91, 92.
 — Impennis, 92.
 Alcedo, 72, 73.
 Ammodytes, 122, 123.
 — Lancea, 123.
 — Tobianus, 123.
 Ammonites, 129.
 Amphacanthurus, 115.
 — Guttatus, 115.
 Amphiprion, 112.
 Amphibæna, 104.
 — Alba, 104.
 Ampullaria, 134.
 Anabas, 115.
 Anableps, 117, 118.
 — Tetrophthalmus, 118.
 Anarrhæas, 116.
 — Lupus, 115, 116.
 Anas, 96, 97.
 — Clypeata, 97.
 Anastomus, 86.
 — Lamelligerus, 86.
 — Typus, 86.
 Anatifera, 137.
 Anguiformia, 103.
 Anguilla, 122.
 — Acutirostris, 122.
 — Latirostris, 122.
 — Medirostris, 122.
 Anguilliformes, 122.
 Anolis, 101.
 — Bullaris, 101.
 — Capensis, 101.
 Anser, 96, 97.
 — Albifrons, 97.
 — Canadensis, 97.
 — Cinereus, 97.
 — Hyperboreas, 97.
 Anthia, 141.
 Anthrax, 144.
 Antelope, 51, 52.
 — Arundinacea, 53.
 — Babalis, 52.
 — Caama, 52.
 — Catoblepas, 53.
 — Cervicapra, 52.
 — Dama, 53.
 — Doreas, 52.
 — Eleotragus, 53.
 — Equina, 53.
 — Eucore, 52.
 — Grinnia, 52.
 — Gutturosa, 52.
 — Kevella, 52.
 — Leucophaea, 53.
 — Lerwia, 52.
 — Orcas, 53.
 — Oryx, 52.
 — Picta, 53.
 — Pygarga, 52.
 — Pygmaea, 53.
 — Redunca, 53.
 — Rupicapra, 53.
 — Saiga, 52.
 — Scoparia, 53.
 Antelope, Scripta, 53.
 — Senegalensis, 52.
 — Strepsiceros, 53.
 — Sylvatica, 53.
 — Trago-camellus, 53.
 Aphis, 140.
 Aplysia, 133.
 Apodo-malacopterygia, 122.
 Aptenodytes, 91, 92, 93.
 — Patagonica, 92.
 Aptera, 141.
 Aracari, 75.
 Arachnida, 147.
 Aranea, 147.
 Araneida, 147.
 Araneus, 111.
 Arctomys, 36, 38.
 — Marmotta, 38.
 Ardea, 85.
 — Coromandeliana, 86.
 — Egretta, 86.
 — Major, 85.
 — Stellarus, 86.
 Argala, 86.
 Argentine, 119, 120.
 — Sphyræna, 120.
 Argonauta, 127—130.
 — Argo, 128.
 — Varicosta, 128.
 Ascaaphus, 139.
 Aspredo, 118.
 Asterias, 149.
 Asteroid, 149.
 Astrea, 154.
 Atherina, 111.
 Atropis, 114.
 Auchenia, 49.
 Axolotl, 109.
 BADUR, 11.
 Balanus, 138.
 Balena, 56, 57.
 — Boops, 57.
 — Mysticetus, 57.
 — Physalis, 57.
 — Rostrata, 57.
 Balistes Capricornus, 124.
 — Monoceros, 124.
 Bancho, 143.
 Basiliscus, 101.
 — Amboinensis, 101.
 — Cucullatus, 101.
 Batrachia, 106.
 Batrachus, 116.
 Bathyergus, 39, 41.
 — Capensis, 41.
 — Maritimus, 41.
 Bicellaria, 154.
 Bipes Lepidopus, 103.
 Blatta, 139.
 Blennius, Clinus, 115.
 — Gunnellus, 115.
 — Ocellaris, 115.
 — Opistognathus, 115.
 Boa Constrictor, 104.
 — Eryx, 104.
 — Erpeton, 104.
 Bodianus, 111.
 Bogmarus, 115.
 Bombyx, 140.
 Boops, 112.
 Bos Americanus, 54.
 — Bubalus, 54.
 — Taurus, 54.
 — Urus, 54.
 Botryllus, 136.
 Branchyptera, 91.
 Brachyura, 146.
 Bradypus, 42.
 — Didactylus, 42.
 — Tridactylus, 42.
 Brama, 113.
 — Atropis, 113, 114.
 — Marina, 113.
 — Raii, 113.
 Branchipus, 146.
 Branchis Fixis, 125.
 Branchis Liberis, 124.
 Brevipennata, 82.
 Bucco, 75.
 Buceros, 72.
 Bufo, 107.
 — Bombina, 107.
 — Vulgaris, 107.
 Bulimus, 131.
 Bulinas, 131.
 Bulla, 133.
 Bullæa, 133.
 CALLIONYX, 116.
 Calocephala, 29.
 Calyptera, 135.
 Cameloida, 49.
 Camellus, 49.
 — Bactrianus, 50.
 — Dromedarius, 50.
 — Vicunna, 50.
 Camelopardalis, 50, 51.
 — Giraffa, 51.
 Campanularia, 155.
 Camptosomata, 137.
 Cancer, 146.
 Caucroma, 85.
 — Cochlearia, 85.
 Canis, 22, 24.
 — Aureus, 25.
 — Aviarius, 25.
 — Domesticus, 25.
 — Familiaris, 24.
 — Graius Hibernicus, 25.
 — Leverianus, 25.
 — Lupus, 25.
 — Molossus, 25.
 — Sanguinarius, 25.
 — Terrarius, 25.
 — Terra nova, 25.
 — Venaticus, 25.
 — Vulpes, 25.
 — Zorda, 25.
 Cantharus, 111.
 Capra, 52, 53.
 — Egagrus, 53.
 — Depressa, 54.
 — Hircus, 53.
 — Mambrica, 54.
 — Reversa, 54.
 Caprimulgus, 67.
 — Europæus, 68.
 — Macrodiptherus, 68.
 Capros, 114.
 Capula, 135.
 Capuloid, 135.
 Caracaras, 61.
 Carbo Cormoranus, 95.
 Caryophylla, 154.
 Cassica, 69.
 Castor, 35, 37.
 — Fiber, 37.
 Casuarus, 82, 83.
 — Galeatus, 83.
 Caudata, 108.
 Cavia, 39, 41.
 — Aperea, 41.
 — Cobaya, 41.
 Cavicornia, 51.
 Cavolina, 132.
 Cebus, 1, 52.
 — Apella, 5.
 — Ateles, 5.
 — Arachnoides, 5.
 — Beelzebuth, 5.
 — Coaita, 5.
 — Fatnellus, 5.
 — Fuscus, 5.
 — Hypoxanthus, 5.
 — Marginatus, 5.
 — Mycetes, 5.
 — Paniscus, 5.
 — Pentadactylus, 5.
 — Personatus, 5.
 — Ruber, 5.
 — Sciureus, 5.
 Cellepora, 154.
 Cellulacia, 129.
 Centetes, 17.
 Centetes, Semispinosus, 17.
 — Setosus, 17.
 — Spinosus, 17.
 Centriscus, 116, 117.
 — Scolopax, 117.
 Cephalopoda, 127.
 Cepola, 115.
 — Rubescens, 115.
 Cerambyx, 138.
 Cerastes, 106.
 Ceratophris, 107.
 Cercopithecus, 7.
 — Ethiops, 7.
 — Cephas, 7.
 — Diana, 7.
 — Faunus, 7.
 — Mona, 7.
 — Nemæus, 7.
 — Nyctitens, 7.
 — Petaurista, 7.
 — Ruber, 7.
 — Sabæus, 7.
 Cereopsis, 96, 97.
 — Nova Hollandia, 97.
 Ceria, 144.
 Cerithium, 135.
 Cerocoma, 142.
 Ceroplatus, 141.
 Certhia, 71.
 — Familiaris, 71.
 Cervus, 50.
 — Alces, 50.
 — Capreolus, 51.
 — Dama, 51.
 — Elaphus, 51.
 — Tarandus, 51.
 Cetacea, 55.
 Ceyx, 73.
 — Tribrachys, 73.
 — Tridactylus, 73.
 Chætodon, 113.
 — Pinatus, 113.
 — Striatus, 113.
 Chalcides, 100.
 Chamaeleo, 102.
 — Vulgaris, 103.
 Champsia, 99.
 — Sclerops, 100.
 — Vulgaris, 99.
 Champsia, 99.
 Charadrius, 83, 84.
 — Pluvialis, 84.
 Cheilodactylus, 112.
 Cheiromys, 40, 41.
 Cheironectes, 31, 32.
 — Guianensis, 32.
 Cheiroptera, 9.
 Chelifer, 147.
 Chelifera, 147.
 Chelonia, 98.
 — Caretta, 98.
 — Lachrymata, 98.
 — Midas, 98.
 — Virgata, 98.
 Chelys, 98, 99.
 Chilognathosis, 148.
 Chimæra, 125.
 — Callorhyncha, 125.
 — Monstrosa, 125.
 Chionis, 90.
 Chirocentrus, 120.
 Chirotes, 103.
 — Mexicanus, 103.
 — Propus, 103.
 Chloromys, 40, 41.
 Chondropterygii, 124.
 Ciconia, 85.
 — Alba, 86.
 Cidarida, 149.
 Cinæra, 137.
 Cingulata, 42.
 Cinnyrus, 72.
 Cirrhopoda, 137.
 Cirrhines, 118.
 Clausilia, 131.
 Claviculata, 35.
 Clisia, 138.
 Clupea, 119, 120.
 — Harengus, 120.
 Cobitis, 117, 118.
 — Barbatula, 118.
 — Fossilis, 118.
 — Tania, 118.
 Coccus, 140.
 Cœcilia, 106.
 — Glutinosus, 106.
 — Tentaculata, 106.
 Cœlogenus, 40, 41.
 — Paca, 41.
 Coleoptera, 138, 141.
 Cotius, 70.
 Coluber, 104.
 Columba, 81.
 — Carunculata, 81.
 — Coronata, 81.
 — Leucocephalus, 81.
 — Genos, 81.
 — Tabellaria, 81.
 Columbida, 81.
 Colymbus, 91, 92.
 — Cristatus, 92.
 Conia, 138.
 Conirostrata, 68.
 Conurus, 77.
 Coracias, 70.
 — Gracula, 70.
 Corallina, 155.
 Corallium, 154.
 Coriocola, 135.
 Cornicularia, 154.
 Coronula, 137.
 Corvus, 70.
 — Corax, 70.
 — Corone, 70.
 — Frugilius, 70.
 — Glandularius, 70.
 — Monedula, 70.
 — Pica, 70.
 — Temias, 70.
 Coryphæna, 114.
 Corythus, 68, 69.
 — Enucleator, 69.
 — Psittaceus, 69.
 Cottus, 111.
 Couroucou, 76.
 Crambus, 144.
 Crepidula, 135.
 Crensia, 137.
 Crocodilia, 99.
 Crotalus, 105.
 — Horridus, 105.
 Crustacea, 145.
 Cryptonys, 78, 79.
 — Niger, 79.
 Ctenophora, 150.
 Cuculus, 75.
 — Canorus, 75.
 Cultirostrata, 85.
 Cursorius, 83, 84.
 Cyclopterus, 122.
 Cyclostomata, 126.
 Cygnus, 96.
 — Fesus, 97.
 — Gibbus, 97.
 — Mansuetus, 96.
 — Musiens, 97.
 Cymindis, 61.
 Cymodoce, 146.
 Cynthia, 136.
 Cyprinodon, 118.
 Cyprinoida, 117.
 Cyprinus, 117.
 — Carpio, 118.
 Cypselus, 67.
 — Murarius, 68.
 DACTYLOPTERUS, 111.
 — Volitans, 111.
 Daphnia, 146.
 Dasypus, 42.
 — Mulita, 42.
 — Novemcinctus, 42.
 — Octocinctus, 42.
 Dasypus Septemcinctus, 42.
 Dasyurus, 31.
 Dasyurus Cynocephalus, 31.
 — Macrourus, 31.
 — Maugei, 31.
 — Minimus, 31.
 — Pencilatus, 31.
 — Rosmarus, 30.
 — Tafa, 31.
 — Ursinus, 31.
 — Viverrinus, 31.
 Decapoda, 145.
 Delphax, 145.
 Delphinus, 55, 56.
 — Bidens, 56.
 — Delphis, 56.
 — Orca, 56.
 — Phocæna, 56.
 — Rostratus, 56.
 — Tursio, 56.
 Dendrocolaptes, 71.
 Dentex, 112.
 — Vulgaris, 112.
 Dentirostrata, 63.
 Dicæa, 71.
 Dicholophus, 83, 84.
 — Cristata, 84.
 Didelphys, 31, 32.
 — Brachyura, 32.
 — Cayopollin, 32.
 — Crassicaudata, 32.
 — Lanigera, 32.
 — Marsupialis, 32.
 — Murina, 32.
 — Nudicaudata, 32.
 — Opossum, 32.
 — Pusilla, 32.
 — Tricolor, 32.
 — Virginiana, 32.
 Digitigrada, 21.
 Didon, 124.
 — Hystrix, 124.
 Diomedea, 93, 94.
 — Exulans, 94.
 Diopsis, 141.
 Diptera, 141, 144.
 Dipus, 36, 38.
 — Jaculus, 38.
 — Sagitta, 38.
 Distoma, 137.
 Diurna, 58.
 Dolabella, 133.
 Doris, 132.
 Dorso-Nudibranchiate, 131.
 Draco, 101.
 — Fuscus, 101.
 — Lineatus, 101.
 — Viridis, 101.
 Drilus, 142.
 Dromarius, 83.
 — Ater, 83.
 ECAUDATA, 106.
 Echeneis, 122.
 — Remora, 122.
 Echidna, 43.
 — Hystrix, 43.
 — Setosa, 43.
 Echinida, 149.
 Echinodermata, 148.
 Echinoida, 148.
 Echinomya, 141.
 Edentata, 42.
 Edolius, 65.
 Elephas, 44.
 — Africanus, 45.
 — Indicus, 45.
 Elaphrus, 142.
 Eleutherobranchiata, 124.
 Eloida, 132.
 Elophorus, 142.
 Elops, 120.
 Emberiza, 68, 69.
 — Hortulana, 69.
 Emys, 98.
 Eolis, 132.
 Ephemeræ, 143.

- Eproboscifera, 47.
 Equus, 113.
 Equus, 49.
 — Asinus, 49.
 — Caballus, 49.
 — Zebra, 49.
 Erinaceus, 15.
 — Auritus, 15.
 — Europeus, 15.
 Erythrinus, 120.
 Esos, 117, 118.
 — Lucius, 118.
 Eudytes, 91, 92.
 — Glacialis, 92.
 Euryale, 149.
 Eurylaimus, 63, 65.
 — Javanicus, 65.
 Evania, 143.
 Exocetus, 117, 118.
 — Exiliens, 118.
 Exocoetna, 145.
 FALCO, 58, 60.
 — Chicquera, 60.
 — Lophotes, 60.
 — Peregrinus, 60.
 — Punctatus, 60.
 — Tinnunculoidea, 60.
 Felis, 22, 26.
 — Borealis, 28.
 — Brucii, 29.
 — Caligata, 28.
 — Caracal, 28.
 — Catus, 28.
 — Celiogaster, 28.
 — Cervaria, 28.
 — Chans, 28.
 — Concolor, 27.
 — Dicolor, 27.
 — Javanensis, 29.
 — Jubata, 28.
 — Leo, 26.
 — Leopardus, 28.
 — Macrolepis, 28.
 — Macroura, 28.
 — Maniculata, 28.
 — Mitis, 28.
 — Onca, 28.
 — Pajeros, 28.
 — Pardalis, 28.
 — Pardina, 28.
 — Pardus, 28.
 — Rufa, 28.
 — Serval, 28.
 — Tigrina, 28.
 — Tigris, 28.
 Fiatola, 113.
 Fiber, 36, 38.
 Fistularia, 116, 117.
 — Immaculata, 117.
 — Serrata, 117.
 — Tabaccaria, 117.
 Flata, 145.
 Fodienta, 33.
 Forbicinia, 147.
 Foraminifera, 129.
 Forficula, 139.
 Fratercula, 91, 92.
 — Mormon, 92.
 Friagilla, 68, 69.
 — Canaria, 69.
 — Carduelis, 69.
 — Colebs, 69.
 — Domestica, 69.
 — Linaria, 69.
 — Paiteacea, 69.
 Fulgora, 140.
 Fulica, 90, 91.
 GADOIDA, 120, 121.
 — Morrhu, 121.
 Galagos, 9.
 Galbula, 73, 74.
 Galeopithecus, 9.
 — Rober, 10.
 — Variegatus, 10.
 Galeritidae, 149.
 Gallinacea, 77.
 Gallinida, 77.
 Gallinula, 91.
 — Baillonii, 91.
 — Chloropus, 91.
 — Crex, 91.
 — Porzana, 91.
 — Pusilla, 91.
 Gallus, 77, 78.
 — Domesticus, 78.
 — Macartneyi, 78.
 — Sonnerati, 78.
 Garrulus, 70.
 Gasteropoda, 130.
 Gasteropeleus, 120.
 Gasterosteus, 114.
 Gastrobranchus, 126.
 — Cæcus, 126.
 — Dombey, 126.
 Geckotida, 102.
 Gerris, 144.
 Glareola, 89, 91.
 — Torquata, 91.
 Glaucoptis, 70.
 Glaucus, 132.
 Glomeris, 148.
 Gnathobolus, 119, 120.
 — Aculeatus, 120.
 — Spinifer, 120.
 Gobioidea, 115.
 Gobius, 115, 116.
 — Niger, 116.
 Gonorrhyngus, 118.
 Gorgonia, 154.
 Gracula, 70.
 Grallatoria, 82.
 Grapsus, 146.
 Gryllotalpa, 139.
 Gryllus, 139.
 Grus, 87.
 Gulo, 19.
 — Americanus, 21.
 — Barbarus, 21.
 — Mellivorus, 21.
 — Septentrionalis, 21.
 — Ursus, 21.
 — Vittatus, 21.
 Gymnetrus, 115.
 Gymnobranchiata, 131.
 Gymnocephalus, 111.
 Gymnogaster, 115.
 Gymnognathus, 122, 123.
 — Aquilabrat, 123.
 — Electricus, 123.
 Gymnognathus, 123.
 Gypaetus, 58, 60.
 — Barbatus, 60.
 Gypogaster, 58, 61.
 — Capensis, 61.
 HEMATOPUS, 83, 84.
 — Ostralegus, 84.
 Haliens, 95.
 Halmaturus, 34.
 — Bruui, 35.
 — Eugenii, 35.
 — Fasciatus, 35.
 — Gigas, 35.
 — Labiatus, 35.
 — Ruficollis, 35.
 — Rufogriseus, 35.
 Hapale, 6.
 — Argentius, 7.
 — Auritus, 7.
 — Chrysomelas, 7.
 — Humeralifer, 7.
 — Labratus, 7.
 — Leoninus, 7.
 — Leucocephalus, 7.
 — Melanurus, 7.
 — Edipus, 7.
 — Pencillatus, 7.
 — Rufalius, 7.
 — Rufimanus, 7.
 — Ursula, 7.
 — Vulgaris, 7.
 Helix, 131.
 Hemilaviculata, 39.
 Hemipodius, 79.
 Hemiptera, 140, 144.
 Henops, 144.
 Heortariua, 71.
 Herpestes, 22.
 — Egyptiacus, 24.
 — Edwardsii, 24.
 — Griseus, 24.
 — Javanicus, 24.
 — Major, 24.
 — Mungo, 24.
 — Rubes, 24.
 — Vansire, 24.
 Hesperia, 140.
 Heterobranchiata, 135, 136.
 Hetro-malacopterygia, 117.
 Hians, 86.
 Himantopus, 87, 88.
 — Melanopterus, 88.
 — Nigricollis, 88.
 Hippocampus, 124.
 Hipponix, 135.
 Hippopotamus, 47, 48.
 — Amphibius, 48.
 Hirundo, 67.
 — Fuciphaga, 67.
 — Riparia, 67.
 — Rustica, 67.
 — Urbica, 67.
 Hohang Shua, 24.
 Holothuria, 150.
 Homoptera, 145.
 Ilyæna Capensis, 26.
 — Villosa, 25.
 — Vulgaris, 26.
 Hydra, 155.
 Hydrobatas, 96, 97.
 — Lobatus, 97.
 Hydrocharus, 40, 41.
 — Paraguayensis, 41.
 Hydrometra, 144.
 Hydromus, 35, 37.
 — Chrysogaster, 37.
 — Cypu, 37.
 — Leucogaster, 37.
 Hydrophis, 106.
 Hyla, 107.
 Hymenoptera, 139, 143.
 Hypsiprymnus, 34.
 — Marius, 34.
 Hypndaus, 35, 36.
 — Alliaris, 36.
 — Amphibius, 36.
 — Arvalis, 36.
 — Gregalis, 36.
 — Lemmus, 36.
 — Ecnomus, 36.
 — Rotulus, 36.
 — Saxatilis, 36.
 Hyrax Setosus, 48.
 Hystrix, 39, 41.
 — Cristata, 41.
 — Dorsata, 41.
 — Fasciculata, 41.
 — Macroura, 41.
 — Prehensilis, 41.
 IBIS, 87, 88.
 — Falcinellus, 88.
 — Religiosa, 88.
 Ichneumon, 144.
 Icterus, 70.
 Iguana, 101.
 — Tuberculata, 101.
 Iguanida, 101.
 Imperator, 134.
 Infusoria, 151.
 Insecta, 138.
 Invertebrata, 127—156.
 Isopoda, 146.
 Iulus, 148.
 KLEISTAGNATHI, 145.
 Koula Chereous, 34.
 Kurtus, 113.
 LABEOUS, 118.
 Labrax, 117.
 Labrus, 116, 117.
 — Carneus, 117.
 Labyrinthiformia, 115.
 Lacerta, 100.
 Lacertida, 100.
 Læmer Geyer, 60.
 Lagomures, 40, 41.
 Lamellibranchiata, 136.
 Lamellirostrata, 96.
 Lamaungia, 48.
 Lampris, 114.
 Lampyrus, 138.
 Laniogenus, 132.
 Lanius, 63.
 — Collurio, 63.
 — Excubitor, 63.
 Laomedia, 154.
 Laplysia, 133.
 Larus Marinus, 93, 94.
 Lemur, 8.
 — Albifrons, 8.
 Lemur, Albimanus, 8.
 — Catta, 8.
 — Collaris, 8.
 — Fulvus, 8.
 Lemur, Mongooz, 8.
 — Nigrifrons, 8.
 — Ruber, 8.
 — Rufous, 8.
 — Tardigradus, 8.
 Lepadogaster, 121, 122.
 — Ocellatus, 122.
 Lepidoptera, 140, 144.
 Lepidopus, 115.
 Lepisosteus, 120.
 Lepores, 40.
 Leptocephalus, 122, 123.
 — Morrisii, 123.
 Lepus, 39, 40.
 — Cuniculus, 40.
 — Pusillus, 41.
 — Timidus, 40.
 Lestris, 93, 94.
 Libellula, 139.
 Limax, 131.
 Limosa, 87, 88.
 Lipura, 48.
 Littorina, 134.
 Lithobius, 148.
 Lemo-malacopterygia, 120.
 Loligo, 128.
 — Media, 128.
 — Sagittata, 129.
 Lomechusa, 142.
 Loncheres, 40, 41.
 Longipennata, 93.
 Longirostris, 87.
 Lophius, 116.
 — Piscatorius, 116.
 Lophobranchiata, 123.
 Lophophorus, 79.
 Loricaria, 118.
 Loxia, 68, 69.
 — Curvirostrata, 69.
 Lucanus, 138.
 Lutra, 22, 23.
 — Marina, 24.
 — Vulgaris, 24.
 Lycena, 140.
 Lygaeus, 144.
 Lysstra, 145.
 MACRODACTYLA, 89.
 Macropus Minor, 34.
 Macroramphi, 88.
 Macrorhyncha, 30.
 Macroura, 146.
 Mana, 112.
 Malapterus, 118.
 Malthe, 111.
 Malurus, 65.
 — Malachurus, 65.
 Manatus, 55.
 — Americanus, 55.
 — Senegalensis, 55.
 Manis, 42, 43.
 — Pentedactyla, 43.
 — Tetractactyla, 43.
 Mankirio, 90.
 Mantis, 139.
 Marsupialia, 31.
 Masaris, 144.
 Mastodon, 44, 46.
 — Giganteus, 46.
 Matamata, 99.
 Meandrina, 154.
 Megalonyx, 42.
 — Jeffersonii, 42.
 Megalotis, 22, 29.
 — Brucii, 29.
 Megapodius, 90.
 — Freycinetus, 90.
 Megatherium, 42.
 — Cuvieri, 42.
 Melania, 134.
 Meleagris, 79.
 Meles, 19.
 — Labradorius, 21.
 — Vulgaris, 21.
 Meliphaga, 65.
 Melithreptus, 72.
 Melivorus, 19, 21.
 Menopoma, 109.
 Menura, 65.
 — Superba, 65.
 Mephitis, 22, 23.
 Mephitis, Chincha, 23.
 — Putorius, 23.
 Mergus, 96, 97.
 — Merganser, 97.
 Meriones, 36, 38.
 Merops, 72.
 — Apiaster, 73.
 Microglossus, 77.
 Miliola, 130.
 Millepora, 154.
 Minx, 24.
 Mollusca, 127.
 — Dibranchiata, 127.
 — Tetrabranchiata, 127.
 Molochus, 142.
 Molossus, 12.
 — Abrasus, 12.
 — Alecto, 12.
 — Cheiropus, 12.
 — Nasatus, 12.
 — Obscurus, 12.
 — Plicatus, 12.
 — Rufus, 12.
 — Rupellii, 12.
 — Tenuis, 12.
 — Velox, 12.
 Monoceros, 114.
 Monodon, 55.
 — Monoceros, 56.
 Monodonta, 134.
 Monotremata, 43.
 Mormyrus, 118.
 Moschus, 49, 50.
 — Javanicus, 50.
 — Meminna, 50.
 — Moschiferus, 50.
 Motacilla, 65.
 — Boarula, 65.
 Mugil, 115.
 — Cephalus, 115.
 Mugiloida, 115.
 Mullus, 111.
 — Barbatus, 111.
 Murana, 122, 123.
 — Helena, 123.
 — Meleagris, 123.
 — Unicola, 123.
 Mus, 35, 37.
 — Decumanus, 38.
 — Giganteus, 38.
 — Musculus, 38.
 — Rattus, 38.
 — Sylvaticus, 38.
 Muscipeta, 65.
 Muscicap, 63.
 — Albicollis, 63.
 — Grisola, 63.
 — Luctuosa, 63.
 — Parva, 63.
 Musophaga, 75.
 Mustela, 21, 22.
 — Africana, 23.
 — Canadensis, 23.
 — Erminea, 23.
 — Foina, 23.
 — Furo, 22.
 — Martes, 23.
 — Nudipes, 23.
 — Putorius, 22.
 — Sarmatica, 23.
 — Sibirica, 23.
 — Striata, 24.
 — Vulgaris, 23.
 — Zibellina, 23.
 Mutilla, 144.
 Mycteria, 86.
 — Senegalensis, 86.
 Mygale, 15, 18.
 — Muscoritica, 18.
 — Pyrenaica, 18.
 Mygale, 147.
 Myophaea, 70.
 Myoptamus, 36, 38.
 — Bonariensis, 38.
 Myriapoda, 148.
 Myothera, 65.
 Myoxus, 35, 86.
 — Avellanarius, 37.
 — Glis, 36.
 — Nitela, 37.
 Myrmecophaga, 42, 43.
 — Jubata, 43.
 Myrmecleon, 139.
 Naja, 106.
 Naja Lutescens, 106.
 Nandu, 83.
 Nasua, 19.
 — Fusca, 21.
 — Rufa, 21.
 Natica, 134.
 Naucoris, 140.
 Nautilus, 128.
 — Paper, 128.
 — Pompilius, 128.
 Necrodes, 143.
 Necrophorus, 142.
 Nemoptera, 139.
 Nerita, 134.
 Neritina, 134.
 Neuroptera, 139, 143.
 Nirmidia, 147.
 Nitidula, 143.
 Noctilio, 13.
 Noctua, 140.
 Nodosaria, 130.
 Notarchus, 133.
 Notoacta, 140.
 Notopterus, 120.
 Notornis, 142.
 Novacula, 117.
 Numenius, 87, 88.
 — Borealis, 88.
 — Arquantus, 88.
 — Longirostris, 88.
 — Phaopus, 88.
 Numida, 79.
 Nycterus, 13.
 Nycticebus Javanicus, 9.
 Nycticeius, 13.
 OCELOT, 28.
 Octopoda, 127.
 Octopus, 118.
 — Vulgaris, 128.
 Oculina, 154.
 Ocypterus, 65.
 Ocythoe Cranchii, 128.
 Edicnemus, 83, 84.
 — Crepitans, 84.
 Omophron, 142.
 Onchidorus, 132.
 Ondatra, 36, 38.
 — Zibethicus, 38.
 Ophicephalus, 115.
 — Punctatus, 115.
 — Striatus, 115.
 Ophidia, 103.
 Ophidium, 122, 123.
 — Imberbis, 123.
 Ophisaurus, 104.
 Ophisurus, 122.
 — Hyala, 122.
 Ophiura, 149.
 Opisthocornus, 79.
 Orbiculina, 130.
 Oriolus, 65.
 — Catbula, 65.
 Orthoptera, 139, 143.
 Orthogoriscus, 124.
 — Oblongus, 124.
 Orycteropus, 43.
 — Capensis, 43.
 Osphronemus, 113.
 Ostracion, 124.
 — Triquetrum, 124.
 Otaria, 29, 30.
 Otion, 137.
 Otis, 83.
 — Tarda, 84.
 Otolicnus, 9.
 — Crassicaudatus, 9.
 — Dermdorfii, 9.
 — Guineensis, 9.
 — Madagascariensis, 9.
 — Senegalensis, 9.
 Ovis, 52, 54.
 — Ammon, 54.
 — Anglicus, 54.
 — Aries, 54.
 — Dolichura, 54.
 — Gallicus, 54.
 — Guineensis, 54.
 — Hispanicus, 54.
 — Laticaudata, 54.
 — Polyceratus, 54.
 PACHYDERMATA, 44.
 Pachyptila, 93.

- Pachyptila, Vittata, 94.
 Pagurus, 146.
 Palamedea Cornuta, 90.
 Pallibranchiate, 136.
 Palmipeda, 91.
 Paludina, 134.
 Panorpa, 143.
 Paper Nautilus, 128.
 Papio, 4.
 — *Aethiops*, 4.
 — *Aubis*, 4.
 — *Carbonarius*, 4.
 — *Comatus*, 4.
 — *Cynocephalus*, 4.
 — *Cynomolgus*, 4.
 — *Hamadryas*, 4.
 — *Inuus*, 1.
 — *Leucophaeus*, 4.
 — *Maurus*, 4.
 — *Mormon*, 4.
 — *Nemestrinus*, 4.
 — *Porcarius*, 4.
 — *Radiatus*, 4.
 — *Rhesus*, 4.
 — *Silenus*, 4.
 — *Sinicus*, 4.
 — *Speciosus*, 4.
 Paradisea, 68, 69.
 — *Apoda*, 69.
 Paradolutes, 65.
 Paradoxurus, 22, 29.
 Paralepis, 111.
 Parra, 89, 90.
 — *Aenea*, 90.
 — *Chilensis*, 90.
 — *Chinensis*, 90.
 Parns, 68.
 — *Caudatis*, 69.
 Passerina, 63.
 Pastor, 65.
 Pavo, 80.
 — *Cristatus*, 80.
 Pectinibranchiata, 134.
 Pectoralipeda, 116.
 Pedetes, 36, 38.
 — *Capensis*, 38.
 Pediculus, 147.
 Peduncular, 137.
 Pogasus, 123.
 — *Draco*, 124.
 Pelagia, 30.
 Pelamis, 106.
 Pelecanus, 94, 95.
 — *Onocrotalus*, 95.
 Pentalamis, 137.
 Percis, 111.
 Peristedion, 111.
 Perameles, 31, 32.
 — *Bougainvillei*, 32.
 — *Lawsonii*, 32.
 — *Nasuta*, 32.
 — *Obesula*, 32.
 Perca, 110.
 — *Fluviatilis*, 110.
 Percnopter, 58, 60.
 — *Aegyptiacus*, 60.
 Percoida, 110.
 Percophis, 111.
 Perdix, 80.
 Perioptthalmus, 116.
 Peronia, 132.
 Petauris, 32, 33.
 — *Flaviventer*, 33.
 — *Macrurus*, 33.
 — *Pernii*, 33.
 — *Pygmaeus*, 33.
 — *Taguanoides*, 33.
 Petromyzon, 125, 126.
 Phacochærus, 48.
 Phaeton, 95.
 — *Phenocurus*, 96.
 Phalaropus, 87, 88.
 Phaleris, 92, 93.
 Phalingista, 32, 33.
 — *Cavifrons*, 33.
 — *Chrysorrhos*, 33.
 — *Cookii*, 33.
 — *Fulgiosa*, 33.
 — *Gliriformis*, 33.
 — *Maculata*, 33.
 — *Macroura*, 33.
 — *Nana*, 33.
 — *Ursina*, 33.
 — *Vulpina*, 33.
 — *Xanthopus*, 33.
 Phasianella, 134.
 Phasianus, 78.
 — *Amherstiae*, 78.
 — *Nyctemerus*, 78.
 Phascocartos, 33, 34.
 — *Cinereus*, 34.
 Phascologale, 31.
 — *Minima*, 31.
 Phascolumys, 33.
 — *Bassii*, 33.
 Phibalura, 65.
 Phoca, 29.
 — *Leptonyx*, 30.
 — *Monachus*, 30.
 — *Vitulina*, 29.
 Phœnicophaeus, 75.
 Phœnicopter, 90.
 Phycis, 120, 121.
 Phyllornis, 65.
 Phyllostoma, 10, 12.
 — *Bidens*, 13.
 — *Brachyotum*, 13.
 — *Brevicaudatum*, 13.
 — *Cirrhosum*, 13.
 — *Crenulatum*, 13.
 — *Elongatum*, 13.
 — *Hastatum*, 12.
 — *Jamaicense*, 13.
 — *Lilium*, 13.
 — *Lineatum*, 13.
 — *Macrophyllum*, 13.
 — *Perspicillatum*, 13.
 — *Planirostre*, 13.
 — *Rotundum*, 13.
 — *Spectrum*, 13.
 — *Superciliatum*, 13.
 Physaphora, 150.
 Physæ, 131.
 Physeter, 56.
 — *Macrocephalus*, 56.
 — *Microps*, 56.
 — *Orthodon*, 56.
 — *Tursio*, 56.
 Phytotoma, 70.
 Picumus, 74, 75.
 — *Abnormis*, 75.
 — *Cirrhatas*, 75.
 — *Exilis*, 75.
 — *Minutissimus*, 75.
 Picucules, 71.
 Picus, 74.
 — *Martius*, 74.
 — *Tridactylus*, 74.
 Pileopsis, 135.
 Pimelodes, 117, 118.
 — *Cyclopum*, 118.
 Pinnata, 29.
 Pipæ, 107, 108.
 — *Surinamensis*, 108.
 Pipra, 65.
 Pisces, 110.
 — *Ossci*, 110.
 Pithecia, 1, 6.
 — *Capillamentosus*, 6.
 — *Cheiroptes*, 6.
 — *Hirsutus*, 6.
 — *Inustus*, 6.
 — *Leucocephalus*, 6.
 — *Melanocephalus*, 6.
 — *Monachus*, 6.
 — *Ocrocephalus*, 6.
 — *Rufibarbatus*, 6.
 — *Rufiventer*, 6.
 — *Sagulatus*, 6.
 — *Satanus*, 6.
 Pitta, 65.
 Plagiostomata, 126.
 Plantigrada, 18.
 Platelea, 87.
 — *Ajaja*, 87.
 — *Leucorodia*, 87.
 — *Tenuirostris*, 87.
 Platessa Vulgaris, 121.
 Platycephalus, 111.
 Platyrrhynchus, 65.
 Plecotas, 10, 13.
 — *Barbastellus*, 13.
 — *Vulgaris*, 13.
 Plectognathi, 124.
 Plectropoma, 111.
 Pleurobranchus, 133.
 Pleuronectoida, 120.
 Ploceus, 70.
 Plotus, 95, 96.
 Plumatella, 155.
 Plumularia, 154.
 Plectolophus, 77.
 Podargus, 67, 68.
 Podiceps, 91, 92.
 Podiceps, Cornutus, 92.
 Podoa, 91, 92.
 — *Senegalensis*, 92.
 — *Surinamensis*, 92.
 Podophthalmus, 145.
 Podura, 147.
 Poecilia, 118.
 Pogonias, 75.
 Pollicipes, 137.
 Polyacanthus, 115.
 Polycera, 132.
 Polycheilus, 102.
 Polyclinum, 136.
 Polydesmus, 148.
 Polygonata, 146.
 Polyneumus, 111.
 Polyodon, 125.
 — *Folium*, 125.
 Polyphemus, 146.
 Polyplectron, 89.
 Polyps, 153.
 Polypteris, 120.
 Polystomella, 130.
 Pomatorhinus, 72.
 Porythius, 72.
 — *Turidinus*, 72.
 Pompilus, 140.
 Porcellus, 146.
 Porphyrio, 90.
 — *Pulverulentus*, 90.
 Porypteris, 120.
 Premnas, 112.
 Presirostrata, 83.
 Priacanthus, 111.
 Priodon, 115.
 — *Annulatus*, 115.
 Prionites, 73.
 Prionodontia, 24.
 Priononotus, 112.
 Prionurus, 115.
 Pristigaster, 120.
 Pristis, 126.
 Pristomoma, 112.
 Proboscifera, 44.
 Procellaria, 93.
 Procinas, 65.
 Procyon, 19, 20.
 — *Caocivorus*, 21.
 — *Lotor*, 21.
 Proteles, 22, 29.
 Proteus, 108, 109.
 — *Anguinus*, 109.
 Pseudo Boa, 106.
 Pseudopus, 104.
 — *Pallasii*, 104.
 Psittacida, 76.
 — *Aracanga*, 77.
 — *Erythræus*, 77.
 — *Goliath*, 77.
 — *Nasicus*, 77.
 — *Pileatus*, 77.
 — *Solstitialis*, 77.
 Psittacirostra, 70.
 Psittacula, 77.
 Psophia, 87.
 — *Crepitans*, 87.
 Pterocles, 80.
 Pteroglossus, 75.
 Ptilonorhynchus, 65.
 Pterois, 112.
 Pteromys, 39, 41.
 Pteromyzon, 125, 126.
 — *Maximus*, 126.
 Pteropoda, 135.
 Pteropus, 10, 11.
 — *Dasyballus*, 11.
 — *Edulis*, 11.
 — *Geoffroyi*, 12.
 — *Griseus*, 11.
 — *Javanicus*, 11.
 — *Kerandrenius*, 11.
 — *Marginatus*, 12.
 — *Medius*, 11.
 — *Melanocephalus*, 12.
 — *Minimus*, 12.
 — *Pallidus*, 11.
 — *Personatus*, 11.
 — *Phaiops*, 11.
 — *Poliocephalus*, 11.
 — *Rubricollis*, 11.
 — *Stramineus*, 12.
 Pteropus, Titthæcheilus, 12.
 — *Vulgaris*, 11.
 Puffin, 92.
 Pulex, 141.
 Pulmonifera, 130.
 Pupa, 131.
 Pycnibranchiata, 125.
 Pygopus, 101.
 Pyrgoma, 137.
 Pyrrhocorax, 65.
 Pyrrhula, 70.
 Python, 104.
 — *Poda*, 104.
 QUADRUMANA, 1.
 RADIATA, 149.
 Raia, 125, 126.
 — *Clavata*, 126.
 Rallus, 90, 91.
 Ramphastoma, 99.
 Ramphastos, 76.
 Rana, 107.
 — *Esculenta*, 107.
 Raphidia, 143.
 Recurvirostra, 87, 88.
 Regalecus, 115.
 Renilla, 154.
 Reptilia, 98.
 Rhagium, 142.
 Rhea, 82, 83.
 Rhinolophus, 10, 13.
 — *Bibastatus*, 13.
 — *Clivossus*, 13.
 — *Commerstonii*, 13.
 — *Deformis*, 13.
 — *Diodema*, 13.
 — *Larvatus*, 13.
 — *Minor*, 13.
 — *Nobilis*, 13.
 — *Speoris*, 13.
 — *Trideos*, 13.
 — *Unihastatus*, 13.
 — *Vulgaris*, 13.
 Rhinopoma, 10, 13.
 — *Microphyllus*, 13.
 Rhombus, 121.
 — *Cardina*, 121.
 Rhynchea, 87, 88.
 Rhyncobdella, 114.
 Rhyncops, 93, 94.
 — *Nigra*, 94.
 Ricinus, 147.
 Rodentia, 35.
 Rotalia, 130.
 Ruminantia, 49.
 Rupicola, 63, 65.
 — *Aurantiaea*, 65.
 Rusticola, 88.
 Rytina, 55.
 — *Stelleri*, 55.
 Ryzæna, 24.
 — *Capensis*, 24.
 SACCOMYS, 36, 39.
 — *Athophilus*, 39.
 Saccopharynx, 122, 123.
 — *Harwoodii*, 123.
 Saccophorus, 36, 39.
 Salamandra, 108.
 — *Maculosa*, 109.
 Salamandrops, 108, 109.
 — *Alleghanensis*, 109.
 Salanx, 118.
 Salaris, 116.
 Salleria, 34.
 Salmo, 119.
 — *Salar*, 119.
 Salmonida, 119.
 Sarcophaga, 15.
 Sarcophagus, 58, 59.
 — *Papa*, 59.
 Sargus, 112.
 — *Annularis*, 112.
 Sasa, 79.
 Sauria, 100.
 Saurus, 119, 120.
 — *Fatus*, 120.
 Saxicola, 65.
 Scalops, 15, 18.
 — *Canadensis*, 18.
 Scalpellum, 137.
 Scansori, 73.
 Scaphidium, 142.
 Scarus, 116, 117.
 Scarus, Cretensis, 117.
 Scatharus, 112.
 Sciæna, 112.
 — *Aquila*, 112.
 Sciaphora, 150.
 Scincus, 103.
 — *Officinalis*, 103.
 Sciurus, 36, 39.
 — *Vulgaris*, 39.
 Scolia, 144.
 Scolopax, 87, 88.
 Scolopendra, 148.
 Scolopisides, 112.
 Scomber, 113.
 Scomberoida, 113.
 Scopus, 86.
 — *Umbretta*, 86.
 Scorpæna, 112.
 Scorpis, 147.
 Scorpis, 113.
 Scutellida, 149.
 Scyllæa, 132.
 Seythrops, 76.
 Sebatas, 112.
 Semnopythecus, 1, 3.
 — *Cristata*, 3.
 — *Entellus*, 3.
 — *Malalophos*, 3.
 — *Maurus*, 3.
 — *Nasica*, 3.
 — *Nemæus*, 3.
 — *Pyrrhus*, 3.
 Seualbria, 154.
 Sepia, 129.
 — *Officinalis*, 129.
 Seps, 103.
 — *Tridactylus*, 103.
 Serialaria, 154.
 Seriola, 114.
 Serranus, 111.
 Serrasalmu, 124.
 Sertularia, 154.
 Setigera, 48.
 Sicydion, 116.
 Sigaretus, 135.
 Sigillina, 137.
 Sillago, 111.
 Silurus, 117, 118.
 — *Glanis*, 118.
 Simia, 1, 2.
 — *Abellii*, 3.
 — *Mormon*, 5.
 — *Pithecius*, 3.
 — *Satanus*, 6.
 — *Satyrus*, 3.
 — *Troglodytes*, 2.
 Siphonaria, 135.
 Siphonophora, 150.
 Siren, 108, 109.
 — *Lacertina*, 109.
 Siro, 147.
 Sitana, 102.
 Sitta, 71.
 — *Europea*, 71.
 Smaris, 112.
 — *Vulgaris*, 113.
 Smaris, 147.
 Solea, 121.
 — *Vulgaris*, 121.
 Solenostomus, 124.
 Solidicornia, 50.
 Solipeda, 49.
 Sorex, 15.
 — *Araneus*, 15.
 — *Brevicaudus*, 16.
 — *Collaris*, 16.
 — *Constrictus*, 16.
 — *Etruscus*, 15, 16.
 — *Flavescens*, 16.
 — *Fodiens*, 16.
 — *Fosterii*, 16.
 — *Giganteus*, 16.
 — *Indicus*, 16.
 — *Leucodon*, 16.
 — *Lineatus*, 16.
 — *Myosurus*, 16.
 — *Palustris*, 16.
 — *Personatus*, 15, 16.
 — *Pulchellus*, 15, 16.
 — *Religiosus*, 16.
 — *Reuteri*, 16.
 — *Tetragonurus*, 16.
 Spalax, 40, 41.
 — *Javanicus*, 41.
 — *Typhlus*, 41.
 Sparactes, 65.
 Sparoida, 112.
 Spatangidæ, 149.
 Spatularia, 125.
 Spermophilus, 36, 39.
 Spagebranchus, 122, 123.
 — *Rostratus*, 123.
 Spheniscus, 92, 93.
 Spheex, 139.
 Sphyræna, 111.
 Spiracularia, 55.
 Spirobranchus, 115.
 Spongia, 156.
 Squalus, 125, 126.
 — *Carcharias*, 126.
 Squatina, 125, 126.
 — *Angelus*, 126.
 Squilla, 146.
 Steganopoda, 94.
 Stelleria, 149.
 Stello, 101.
 — *Vulgaris*, 101.
 Stenonopata, 30.
 Stenops Ceylonicus, 9.
 — *Bengalensis*, 9.
 Stenorhyncha, 30.
 Sterna, 93, 94.
 Sternarchus, 123.
 Sternopyx, 120.
 Sternotherus, 98.
 Stomopoda, 146.
 Strepsilas, 88, 89.
 — *Interpres*, 89.
 Strepsiptera, 145.
 Strix, 61.
 — *Aluco*, 62.
 — *Arctica*, 62.
 — *Ascalaphus*, 62.
 — *Asio*, 63.
 — *Bengalensis*, 62.
 — *Brachiolus*, 63.
 — *Bubo*, 62.
 — *Chouchou*, 61.
 — *Flammea*, 62.
 — *Funerea*, 62.
 — *Griseata*, 62.
 — *Hylophila*, 62.
 — *Javanica*, 62.
 — *Lactea*, 63.
 — *Laponica*, 62.
 — *Leucotis*, 63.
 — *Lineata*, 62.
 — *Macrorhyncha*, 63.
 — *Nebulosa*, 62.
 — *Nisus*, 61.
 — *Nyctea*, 61.
 — *Otus*, 62.
 — *Pagodarum*, 62.
 — *Passerina*, 62.
 — *Perlata*, 62.
 — *Pulsatrix*, 62.
 — *Streptopus*, 62.
 — *Stridula*, 62.
 — *Sultanus*, 62.
 — *Sumatrana*, 62.
 — *Tengmalmi*, 62.
 — *Uralensis*, 61.
 Stromateus, 114.
 Struthio, 82.
 — *Camellus*, 82.
 Sturionida, 125.
 Sturnus, 70.
 — *Carunculatus*, 70.
 — *Musculus*, 70.
 — *Pharoides*, 70.
 — *Vulgaris*, 70.
 Stylephorus, 114.
 — *Chordatus*, 114.
 Stylops, 145.
 Sutoria, 141.
 Sula, 95, 96.
 — *Alba*, 96.
 Sus, 47, 48.
 — *Domesticus*, 48.
 — *Moongulus*, 48.
 — *Porcus*, 48.
 — *Scrofa*, 48.
 — *Simensis*, 48.
 — *Tursica*, 48.
 Sylvia, 65.
 — *Atricapilla*, 66.
 — *Cinerea*, 66.
 — *Curruca*, 66.
 — *Luscinia*, 66.
 — *Phenocurus*, 66.

- Sylvia, Phragmitis, 66.
 — Provincialis, 66.
 — Rubecula, 66.
 — Sibilatrix, 66.
 — Trochilus, 66.
 Synallaxis, 72.
 Synanceia, 112.
 Synbranchus, 123.
 Syndactyla, 72.
 Synnathus, 123.
 — Rondoletii, 123.
 — Typhlus, 123.
 — Viridis, 123.
 Synodorus, 118.
 Synoicum, 137.
 Syrrhaptus, 80.
 TABANUS, 141.
 Tachydromus, 101.
 Tachypetes, 95.
 — Aquilus, 95.
 Tachys, 142.
 Tænioida, 113.
 Talpa, 15, 16.
 — Cæca, 17. "
 — Vulgaris, 17.
 Tamatia, 76.
 Tamias, 36, 39.
 Tamias, 75.
 Tanagra, 63.
 — Vittata, 64.
 Tandrek, 17.
 — Silky, 17.
 — Spiny, 17.
 Tantalus, 86.
 — Ibis, 86.
 — Lacteus, 86.
 — Leucocephalus, 86.
 Taphozous, 10, 13.
 Taphozous, Lepturus, 13.
 — Longimanus, 13.
 — Mauritianus, 13.
 — Perforatus, 13.
 — Rufus, 13.
 Tapirus, 47, 48.
 — Americanus, 48.
 Tardigrada, 42.
 Tarsius, 9.
 — Baneanus, 9.
 — Fuscimanus, 9.
 — Spectrum, 9.
 Tectibranchiata, 132.
 Tenuirostrata, 71.
 Terrapene Trifasciatus, 98.
 Testacella, 131.
 Testudo, 98.
 — Græca, 98.
 — Indica, 98.
 Tethys, 132.
 Tetrao, 80.
 Tetraodon, 124.
 Tetragonopterus, 120.
 Tetragonurus, 115.
 Tetrapturus, 114.
 Textularia, 130.
 Thamnophilus, 66.
 Therapon, 111.
 Thereva, 141.
 Thrips, 145.
 Thyssa, 120.
 Thunnus, 114.
 Thylacinus, 31.
 — Harrisii, 31.
 Thymallus, 120.
 Thyrsites, 114.
 Thysanoura, 147.
 Tichodroma, 71.
 — Phænicoptera, 71.
 Timalia, 66.
 Tinactor, 72.
 Tinamus, 81.
 Tingis, 144.
 Todus, 73.
 — Viridis, 73.
 Torpedo, 125, 126.
 — Narke, 126.
 Tortrix, 104.
 — Scytale, 104.
 Totanus, 88, 89.
 Torotes, 113.
 Trachinotus, 114.
 Trachinus, 110.
 — Draco, 111.
 Tragopan, 78, 79.
 — Satyrus, 79.
 Trapelus, 102.
 Trichechus, 29, 30.
 — Rosmarus, 30.
 Trichechus Borealis, 55.
 Trichiurus, 114.
 — Lepturus, 114.
 Trichodon, 111.
 Trichonotus, 115.
 Trichophorus, 66.
 Trichoptera, 143.
 Trichopus, 115.
 Tridactylus, 143.
 Trigla, 111.
 Trigonoccephalus, 106.
 Trimeresurus, 106.
 — Microcephalus, 106.
 Tringa, 88, 89.
 Trionyx, 98, 99.
 — Egyptiacus, 99.
 Tritodon, 124.
 Triton, 108, 109.
 — Gesneri, 109.
 Tritonia, 132.
 Trochilus, 71.
 — Lalandii, 72.
 — Ornismya, 72.
 Trochoid, 134.
 Trochus, 134.
 Trogon, 76.
 Tropidurus, 102.
 — Torquatus, 102.
 Truxalis, 143.
 Tubicinella, 137.
 Tubipora, 154.
 Tubularia, 154.
 Tunicata, 135.
 Tupinambis, 100.
 Turbo, 134.
 Turdus, 64.
 — Merula, 64.
 — Musicus, 64.
 — Polyglottus, 64.
 Turnstone, 89.
 Typhlops, 104.
 Tyrannus, 66.
 ULEIOTA, 142.
 Umbella, 133.
 UMBER, 112.
 Umbrina, 112.
 Upeneus, 111.
 Upupa, 71, 72.
 — Epops, 72.
 Uranodon, 56, 57.
 — Bidens, 57.
 Uranoscopus, 111.
 Uria, 92, 93.
 Urocærus, 139.
 Uromatrix, 102.
 Ursus, 18, 19.
 — Americanus, 19.
 Ursus Arctos, 19.
 — Cinereus, 20.
 — Eurypilus, 20.
 — Labiatus, 20.
 — Malayanus, 20.
 — Ornatus, 20.
 — Polar, 20.
 VAOINALIS, 90.
 Vanellus, 83, 84.
 — Melanogaster, 84.
 Ventroneudibranchiata, 131.
 Veretillum, 155.
 Vertebrata, 1—127.
 Vespertilio, 11, 14.
 — Barbastellus, 14.
 — Bechsteinii, 14.
 — Dasycaurus, 14.
 — Daubentonii, 14.
 — Discolor, 14.
 — Lævis, 14.
 — Leucogaster, 14.
 — Maximus, 14.
 — Murinus, 14.
 — Mystacinus, 14.
 — Naso, 14.
 — Nattereri, 14.
 — Nigricans, 14.
 — Noctula, 14.
 — Pictus, 14.
 — Pipistrellus, 14.
 — Polythrix, 14.
 — Pygmaeus, 14.
 — Serotinus, 14.
 Vespertilio Vampyrus, 11.
 Vinago, 82.
 — Abyssinia, 82.
 Vipera, 105.
 — Berus, 105.
 Viverra, 22.
 Viverra, Civetta, 24.
 — Fasciata, 24.
 — Fossa, 24.
 — Genetta, 24.
 — Gracilis, 24.
 — Hermaphrodita, 24.
 — Indica, 24.
 — Zibetha, 24.
 Vomer, 114.
 Vultur, 58.
 — Egyptius, 58.
 — Angolensis, 59.
 — Arrianus, 58.
 — Auricularis, 58.
 — Fulvus, 58.
 — Galerulatus, 59.
 — Imperialis, 59.
 — Indus, 59.
 — Kolbi, 59.
 — Ponticerianus, 58.
 XANTHORUS, 70.
 Xenops, 71.
 — Genibarbis, 71.
 — Rutilans, 71.
 Xenos, 145.
 Xiphia, 114.
 — Gladins, 114.
 Xiphotheca, 115.
 Xirichthys, 117.
 YUNX, 74.
 — Torquilla, 75.
 ZEUS, 114.
 — Faber, 114.
 Zoanthus, 154.
 Zoarchus, 116.
 Zygodactyla, 73.



INDEX OF COMMON NAMES.

ACALEPHS, 150.
 — Ctenophorous, 150.
 — Diphydous, 150.
 — Physaphorous, 150.
 — Sciaphorous, 150.
 — Siphonophorous, 150.
 — Veleidous, 151.
 Albatross, 94.
 — Wandering, 94.
 Alligator, 99.
 Ammonite, 129.
 Ananome, 86.
 — African, 86.
 — Indian, 86.
 Anchovies, 120.
 Angel Fish, 126.
 Angler, 116.
 — Common, 116.
 Ant-eater, 43.
 — Aculeated, 43.
 — Black, 43.
 — Double-striped, 43.
 — Great, 43.
 — Lest, 43.
 — Middle, 43.
 — Ringed, 43.
 Armadillo, 42.
 — Apar, 42.
 — Great, 42.
 — Nine-banded, 42.
 — Peludo, 42.
 — Picby, 42.
 — Six-banded, 42.
 — Three-banded, 42.
 — Twelve-banded, 42.
 Articulated Animals, 138.
 Ass, 49.
 BABOON, 4.
 — Anubis, 4.
 — Black-faced, 4.
 — Common, 4.
 — Dog-faced, 4.
 — Great, 2, 4.
 — Grey, 4.
 — Hog-faced, 4.
 — Lesser, 4.
 — Lion-tailed, 4.
 — Pig-tailed, 4.
 — Porcine, 4.
 — Red-faced, 4.
 — Ribbed-nose, 4.
 — Wood, 4.
 — Wrinkled, 4.
 Badger, 21.
 — American, 21.
 — Common, 21.
 Banana-eater, 75.
 Band Fish, 113, 115.
 — Rubescent, 115.
 Barbel, 117.
 Barbet, 75.
 Barbican, 75.
 Basilisk, 101.
 — Amboina, 101.
 Bat, 9.
 — Bechstein's, 14.
 — Blackish, 14.
 — Common, 14.
 — Daubenton's, 14.
 — Eared, 13.
 — Fruit-eating, 9, 10, 11.
 — Great, 14.
 — Hairy, 14.
 — Hairy-armed, 14.
 — Hare-lipped, 13.
 — Horse-shoe (various), 13.
 — Javelin, 13.
 — Leafless-nosed, 9, 10, 12.
 — Long-nosed, 14.
 — Mouse-coloured, 14.

Bat, Painted, 14.
 — Parti-coloured, 14.
 — Pygmy, 14.
 — Reddish-grey, 14.
 — Serotine, 14.
 — Serotine, Great, 14.
 — Slender, 14.
 — Spectre, 13.
 — Vampire, 13.
 — Whiskered, 14.
 — White-bellied, 14.
 Bear, 19.
 — Black, 19.
 — Bornean, 20.
 — Brown, 19.
 — Cordilleras, 20.
 — Grisly, 20.
 — Juggler, 20.
 — Malay, 20.
 — Maritimus, 20.
 — Thibet, 20.
 Beaver, 37.
 — Musk, 38.
 Bee-eater, 73.
 — Common, 73.
 Beef-eater, 69.
 Berg-haas, 38.
 Biped, 103.
 — Scaly-footed, 103.
 Bittern, 85.
 Black Cap, 66.
 Boar Fish, 114.
 Boat-bill, 85.
 Bony Fishes, 110.
 Booby, 96.
 Bream, 112, 113.
 Bream (Carp), 118.
 Bristle-neck, 66.
 Broad-beak, 65.
 Broadhead, 111.
 Buffalo, 54.
 Bullhead, 111.
 Bunting, 69.
 — Common, 69.
 — Ortolan, 69.
 — Reed, 69.
 — Snow, 69.
 — Yellow, 69.
 Bustard, 83.
 — Great, 84.
 Butcher, 65.
 — Bird, 63.
 Buzzard, 61.
 CACHALOT, 56.
 — Great-headed, 56.
 — High-finned, 56.
 Calamary, 129.
 Campagnol, 36.
 — Garlic, 36.
 — Red, 36.
 — Rock, 36.
 — Social, 36.
 Carp, 117.
 — Barbel, 117.
 — Bream, 118.
 — Cirrhioe, 118.
 — Gooorhynque, 118.
 — Gudgeon, 117.
 — Laboeus, 118.
 — Tench, 118.
 — White Fish, 118.
 Cartilaginous Fishes, 124.
 Cassowary, 83.
 Cat, 28.
 — Angora, 28.
 — Booted, 28.
 — Cape, 28.
 — Chartreux, 28.
 — Common, 28.
 — Domestic, 28.
 — Eyra, 28.
 — Oceloid, 28.

Cat, Pampa, 28.
 — Pernvian, 28.
 — Spanish, 28.
 — Tortoiseshell, 28.
 Cat Fish, 116.
 Cavy, 41.
 — Rock, 41.
 — Restless, 41.
 — Spotted, 41.
 Chamelion, 102.
 — Common, 103.
 Channel-bill, 76.
 Civet, True, 24.
 Cobra di Capello, 24.
 Cock, 78.
 — Domestic, 78.
 — Crested, 78.
 — Sonnerat's, 78.
 Cod Fish, 120, 121.
 — Common, 121.
 — Hake, 121.
 — Ling, 121.
 — Rockling, 121.
 — Torsk, 121.
 — Whiting, 121.
 Colin, 80.
 Colugo, 10.
 — Red, 10.
 Coot, 91.
 Cormorant, 95.
 — True, 95.
 Corn-crake, 91.
 Courser, Bronzed-winged, 84.
 Couscou, 33.
 — Goldeo-rumped, 33.
 — Large-tailed, 33.
 — Spotted, 33.
 — Surinam, 33.
 — Ursine, 33.
 — White, 33.
 Coypu, 37, 38.
 — Mus, 37.
 — White-bellied, 37.
 — Yellow-bellied, 37.
 Crab, 146.
 Cramp Fish, 126.
 — Eyed (or Spotted), 126.
 Crane, 87.
 — Gigantic, 86.
 Creeper, 71.
 — Mountain, 72.
 — Wall, 71.
 — True, 71.
 Crocodile, 99.
 — Common, 99.
 — Indian, 99.
 — Nilotic, 99.
 Cross-bill, 69.
 — Common, 69.
 — Parrot, 69.
 Crow, 70.
 — Carrion, 70.
 — Jackdaw, 70.
 — Jay, 70.
 — Magpie, 70.
 — Nutcracker, 70.
 — Raven, 70.
 — Rook, 70.
 Cuckoo, 75.
 — Barbacous, 75.
 — Common, 75.
 — Coua, 75.
 — Concal, 75.
 — Courol, 75.
 — Honey Guide, 75.
 Curlew, 88.
 — Esquimaux, 88.
 — Long-billed, 88.
 Cuttle Fish, 129.
 — Skeleton of, 129.
 Cutwater, 94.
 — Black, 94.

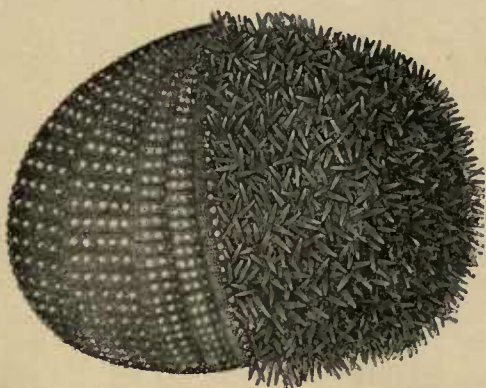
DARTER, 96.
 — Black-bellied, 96.
 — Le Vaillant's, 96.
 — White-bellied, 96.
 Dasyure, 31.
 — Brush-tailed, 31.
 — Dog-headed, 31.
 — Long-tailed, 31.
 — Maugean, 31.
 — Tapha, 31.
 — Ursine, 31.
 — Viverrine, 31.
 — Yellow, 31.
 Daubenton's Tarsier, 96.
 Deer, 50, 51.
 — American, 51.
 — Fallow, 51.
 — Mexican, 51.
 — Moose, 51.
 — Porcine, 51.
 — Red, 51.
 — Rein, 51.
 — Rib-faced, 51.
 — Roe-buck, 51.
 — Spotted, 51.
 — Tail-less, 51.
 — Virginian, 51.
 Delundung, 24.
 Desman, 15, 18.
 — Pyrenean, 18.
 — Russian, 18.
 Dibranchiate Mollusks, 127.
 Diphydous, 150.
 Diver, 92.
 — Black-throated, 92.
 — Northern, 92.
 — Red-throated, 92.
 Dog, 24.
 — Beagle, 25.
 — Bloodhound, 25.
 — Bull, 25.
 — Dalmatian, 25.
 — Domestic, 24.
 — Faithful, 24.
 — Foxhound, 25.
 — Greyhound, 25.
 — Harrier, 25.
 — Irish Greyhound, 25.
 — King Charles's, 25.
 — Mastiff, 25.
 — Naked, 25.
 — Newfoundland, 25.
 — Pointer, 25.
 — Pug, 25.
 — Shepherd's, 25.
 — Shock, 25.
 — Spaniel, 25.
 — Terrier, 25.
 — Turnspit, 25.
 — Water, 25.
 Dolphin, 114.
 Donzell, Beardless, 123.
 Doree, 114.
 Dragon, Sea, 124.
 Dragonet, 116.
 Duck, 97.
 — Eider, 97.
 — Garrot, 97.
 — Goganser, 97.
 — Merganser, 97.
 — Shield-rake, 87.
 — Shoveller, 97.
 Dugong, 55.
 EAGLE, 60.
 — Booted, 60.
 — Hawk, 60.
 — Sea, 60.
 — True, 60.
 — True-fishing, 60.
 Eel, 122.
 — Broad-nosed, 122.
 — Conger, 122.
 — Glut (or Snig), 122.

Eel, Sharp-nosed, 122.
 — Snake, 122.
 Eft, 109.
 — Marbled, 109.
 Egret, 85.
 Electric Eel, 123.
 Elephant, 44.
 — African, 45.
 — Indian, 45.
 Emeu, 83.
 Engalla, 48.
 FALCON, 60.
 — Aldrovandi, 60.
 — Black-thighed, 60.
 — Fishing, 60.
 — Hobby, 60.
 — Hooded, 60.
 — Ingrian, 60.
 — Jer, 60.
 — Kestrel, 60.
 — Lanner, 60.
 — Merlin, 60.
 — Passenger, 60.
 — Rufous-backed, 60.
 Fennec, 29.
 Fennek, 25.
 Ferret, 22.
 Fiddle Fish, 126.
 File Fish, 124.
 Finch, 69.
 — Broad-billed, 69.
 — Bull, 70.
 — Chaff, 69.
 — Gold, 69.
 — Parrot, 69.
 — Short-billed, 69.
 Fisher, 23.
 Fishes, 110.
 Fitchet, 22.
 Fixed Gills, 125.
 Flamingo, 90.
 — Chilian, 90.
 — Lesser, 90.
 — Red, 90.
 Flycatcher, 63.
 — Little, 63.
 — Pied, 63.
 — Spotted, 63.
 — White-collared, 63.
 Flying Fish, 118.
 Flying Squirrel, 41.
 — American, 41.
 — Bay, 41.
 — Bristle, 41.
 — Dart, 41.
 — European, 41.
 — Pretty, 41.
 — Severn River, 41.
 Fly-seeker, 65.
 Folded-chest, 120.
 Foot of Gasteropod, 130.
 Fork-beard, 120, 121.
 Fossan, 24.
 Four-finned, 114.
 Four-toothed, 124.
 Fox, 25.
 — Black, 25.
 — Brant, 25.
 — Cape, 25.
 — Corsac, 25.
 — Cross, 25.
 — Cur, 25.
 — Fulvous-necked, 25.
 — Greyhound, 25.
 — Karagan, 25.
 — Mastiff, 25.
 Fraacolin, 80.
 Frigate Bird, 94, 95.
 Fringed-tail, 147.
 Frog, 107.
 — Edible, 107.
 — Brown, 107.
 — Green, 107.

Frog, Horned, 107.
 Frog Fish, 116.
 — Surinam, 117.
 GANNET, 96.
 — White, 96.
 Garangan, 24.
 Gasteropod, 130.
 Gavial, 99.
 Gazelle, 52.
 Gecko, 101, 102.
 — Broad-fingered, 101.
 — Broad-tailed, 101.
 — Egyptian, 102.
 — Fan-fingered, 101.
 — Furrowed-fingered, 101.
 — Half-fingered, 101.
 — Wall, 102.
 Gemsbok, 52.
 Genet, 24.
 — Filleted, 24.
 Gills, Close, 125.
 — Loose, 124.
 Globe Fish, 124.
 Goat, 53.
 — African, 54.
 — Angora, 54.
 — Capricorn, 54.
 — Caucasian, 53.
 — Common, 53.
 — Ibex, 54.
 — Syrian, 53.
 — Whidaw, 54.
 — Yellow, 52.
 Goatsucker, 68.
 — European, 68.
 — Leona, 68.
 Goby, 116.
 — Black, 116.
 God'a Bird, 69.
 Godwit, 88.
 Goose, 97.
 — Bean, 97.
 — Bernicle, 97.
 — Canada, 97.
 — Egyptian, 97.
 — Goosander, 97.
 — Grey, 97.
 — Mother Cary's, 93.
 — Snow, 97.
 — White-fronted, 97.
 — Wild, 97.
 Grackle, 70.
 Grayling, 120.
 Grebe, 92.
 — Coot, 92.
 — Great Crested, 92.
 — Horned, 92.
 — Tippet, 92.
 Grosbeak, 69.
 — Parrot-billed, 69.
 — Pigeon, 69.
 Ground Hog, 43.
 Groundling, 118.
 Ground Squirrel, 39.
 — Four-lined, 39.
 — Hudson's Bay, 39.
 — Line-tailed, 39.
 — Striped, 39.
 Grouse, 80.
 — Land, 80.
 — Ptarmigan, 81.
 — True, 80.
 Gudgeon, 117.
 Guilemot, 93.
 Guinea Pig, 41.
 Gull, 94.
 — Black-backed, 94.
 Gurnard, 111.
 — Red, 111.
 Gymnote, 123.
 — Even-lipped, 123.

- HAIR-TAIL, 114.
 — Silvery, 114.
 Hake, 121.
 Halcyon, 73, 95.
 Halicore, 55.
 Halladrome, 93.
 — Berard's, 93.
 Hare, 40.
 — Alpine, 41.
 — American, 41.
 — Baikal, 41.
 — Brazilian, 41.
 — Buck, 40.
 — Calling, 40, 41.
 — Cape, 41.
 — Common, 40.
 — Jack, 40.
 — Little Chief, 41.
 — Moussel, 41.
 — Ogotoma, 41.
 — Polar, 41.
 — Prairie, 41.
 — True, 40.
 — Variable, 41.
 Harpy, 60.
 Hatchet-belly, 120.
 Haute-beeste, 52.
 Hawk, 60.
 — Dorr, 68.
 — Gos, 60.
 — Sparrow, 60.
 — True, 60.
 Hedgehog, 15.
 — Asiatic, 17.
 — Common, 15, 17.
 — Long-eared, 15.
 — Radiated, 17.
 Helmet Bird, 69.
 Hepona, 33.
 — Black, 33.
 — Long-tailed, 33.
 — Perous, 33.
 — Pigmy, 33.
 — Squirrel-tailed, 33.
 — Yellow-bellied, 33.
 Hereco, 38.
 — Bay, 38.
 — Egyptian, 38.
 — Tamarisk, 38.
 Heron, 85.
 — Bittern, 86.
 — Common, 85.
 — Great Egret, 86.
 Herring, 120.
 Hog Rabbit, 41.
 Honey-eater, 65, 72.
 Honey-sucker, 71.
 Hoopoe, 72.
 — Common, 72.
 Hornbill, 73.
 Horse, 49.
 Humming Bird, 71.
 — Straight-beaked, 72.
 — True, 72.
 Hyæna, 22, 25.
 — Hairy, 26.
 — Striped, 25.
 — Tiger-wolf, 26.
 ICHNEUMON, 24.
 — Edwards', 24.
 — Egyptian, 24.
 — Great, 24.
 — Grey, 24.
 — Indian, 24.
 — Red, 24.
 Infusory Animals, 151.
 — Polygastric, 151.
 — Rotatory, 151.
 — Shell, &c., of, 151.
 — Motive organs of, 151.
 Insects, 138.
 JAHRU, 86.
 — Senegal, 86.
 Jacana, 90.
 — Bronzed, 90.
 — Chilian, 90.
 — Chinese, 90.
 — Cinnamon, 90.
 — Common, 90.
 — Gallinaceous, 90.
 Jackal, 25.
 Jackdaw, 70.
 Jaguarondi, 28.
 Jay, 70.
 Jerboa, 38.
 — Arrow, 38.
 — Egyptian, 38.
 — Siberian, 38.
 Jumping Hare, 38.
 KALONG, 11.
 Kamichi, 90.
 Kangaroo, 34.
 — Banded, 35.
 — Eugene, 35.
 — Great, 35.
 — Lebrun, 35.
 — Lesser, 34.
 — Moustached, 35.
 — Reddish-grey, 35.
 — Red-necked, 35.
 Karagan, 25.
 Kestrel, 60.
 — Carolina, 60.
 — Red-thighed, 60.
 — Rufous-backed, 60.
 King Fish, 114.
 King Fisher, 73.
 Kites, 61.
 LAMPREY, 126.
 — Sea, 126.
 Lapwing, 84.
 — Bastard, 84.
 — Grey, 84.
 — True, 84.
 Lark, 68.
 — Sky, 68.
 — Wood, 68.
 Leaf Bird, 65.
 Lemur, 7, 8.
 — Bengal, 8.
 — Cinereous, 8.
 — Collared, 8.
 — Rufous, 8.
 — Slow, 8.
 — White-footed, 8.
 Leopard, 28.
 — Cayenne, 28.
 — Hunting, 28.
 — Wild, 28.
 Ling, 121.
 Lion, 26.
 — Arabian, 27.
 — Barbary, 27.
 — Cougar, 27.
 — Puma, 27.
 — Senegal, 27.
 Lizard, 100.
 — Eyed Green, 100.
 Loach, 118.
 — Great, 118.
 — Groundling, 118.
 — Spiny, 118.
 Lobster, 146.
 Locust-eater, 65.
 Long-legs, 88.
 — Black-necked, 88.
 Loose Gills, 124.
 Lori, Slender, 9.
 — Slow, 9.
 Ludis, 120.
 Lynx, 28.
 — Bay, 28.
 — Booted, 28.
 — Canadian, 28.
 — Caspian, 28.
 — Fasciated, 28.
 — Florida, 28.
 — Golden, 28.
 — Mountain, 28.
 — Muscorite, 28.
 — Persian, 28.
 — Portuguese, 28.
 — Swedish, 28.
 MACAUCCO, 8.
 — Black, 8.
 — Black-fronted, 8.
 — Brown, 8.
 — Red, 8.
 — Ring-tailed, 8.
 — White-fronted, 8.
 — Woolly, 8.
 Mackerel, 113, 114.
 Madrepore, 152.
 Magpie, 70.
 Maid, 126.
 Maigre, 112.
 Manakin, 65.
 Mantle of Acephals, 136.
 Manul, 29.
 Man-of-war Bird, 95.
 Marmot, 38.
 — Alpine, 38.
 — Bobac, 38.
 — Earless, 38.
 — Hoary, 38.
 — Maryland, 38.
 — Mauline, 38.
 — Quebec, 38.
 Merion, 65.
 — Soft-tailed, 65.
 Mite, 147.
 Mocking Bird, 64.
 Mole, 15, 16.
 — Blind, 17.
 — Common, 17.
 Moll Bless, 41.
 — Zand, 41.
 Molosse, Black, 12.
 — Collared, 12.
 — Dusky, 12.
 — Egyptian, 12.
 — Long-nosed, 12.
 — Plaited, 12.
 — Rufous, 12.
 — Rupelian, 12.
 — Shorn, 12.
 — Slender, 12.
 — Swift, 12.
 Monkey, 1.
 — Bearded, 6.
 — Bonnet, 4.
 — Cat-like, 9.
 — Cochis China, 4.
 — Four-fingered, 1, 5.
 — Fox-tailed, 6.
 — Green, 7.
 — Hare-lipped, 4.
 — Hideous, 6.
 — Horned, 1, 5.
 — Howler, 5.
 — Jackated, 6.
 — Malbrouc, 7.
 — Mustache, 7.
 — Preacher, 5.
 — Proboscis, 4.
 — Red, 1, 5.
 — Short-tailed, 6.
 — Silky, 1.
 — Silvery, 7.
 — Spider, 5.
 — Spotted, 7.
 — Squirrel, 1, 5.
 — Striated, 1.
 — Varied, 7.
 — Vaulting, 7.
 — Weeper, 5.
 — White Eyelid, 7.
 — White-nosed, 7.
 Monkey-like Animals, 2.
 Mouse, 38.
 — American Field, 38.
 — Barbary, 38.
 — Bean, 38.
 — Beech, 38.
 — Common, 38.
 — Corn, 38.
 — Dor, 36.
 — Dwarf, 38.
 — Field, 38.
 — Frugivorous, 38.
 — Harvest, 38.
 — Lineated, 38.
 — Little, 38.
 — Meadow, 36.
 — Oriental, 38.
 — Pouched, 39.
 — Short-tailed, 38.
 — Square-tailed, 38.
 — Wandering, 38.
 Mullet, 115.
 — Common, 115.
 Musk, 50.
 — Kanchil, 50.
 — Napu, 50.
 — Tibet, 50.
 Musquash, 38.
 NANDU, 83.
 Nettle Creeper, 66.
 New Holland Bear, 33.
 Nightingale, 64, 66.
 Norfolk Island Flying Squirrel, 33.
 Nutcracker, 70.
 Nuthach, 71.
 — European, 71.
 OPOSSUM, 32.
 — Cayenne, 32.
 — Dwarf, 32.
 — Large-tailed, 32.
 — Mexican, 32.
 — Molucca, 32.
 — Murine, 32.
 — Naked-tailed, 32.
 — New Holland, 33.
 — Porcine, 32.
 — Short-tailed, 32.
 — Touan, 32.
 — Virginian, 32.
 — White-tailed, 33.
 — Woolly, 32.
 Orang, 1, 2.
 — Black, 2.
 — Dusky, 2.
 — Outang, 1, 2.
 — Red, 2.
 Oriole, 65.
 Ornithorhynchus, 43.
 — Dusky, 44.
 — Paradoxus, 44.
 — Rufous, 44.
 Osprey, 60.
 Ostrich, 82.
 Otary, 30.
 — Cinereous, 30.
 — Crowned, 30.
 — Falkland, 30.
 — Lion-maned, 30.
 — Little, 30.
 — Ursine, 30.
 — White-necked, 30.
 — Yellow, 30.
 Otter, 23.
 — Brazilian, 24.
 — Great, 24.
 — Lesser, 24.
 — Sea, 24.
 Ouaran, 100.
 — Nilotic, 100.
 Oustitis, 6, 7.
 — Black-tailed, 7.
 — Hairy-eared, 7.
 — Pencilled, 7.
 — Whiteheaded, 7.
 — White-shouldered, 7.
 Owl, 62.
 — Acadian, 62.
 — Accipitriae, 62.
 — African spotted, 63.
 — American, 62.
 — Barn, 62.
 — Barred, 62.
 — Bengal-eared, 62.
 — Boobock, 62.
 — Brown, 62.
 — Burrowing, 62.
 — Cayenne, 62.
 — Chestnut, 62.
 — Chestnut-winged, 62.
 — Churn, 68.
 — Cinereous, 62.
 — Collared, 62.
 — Cuckoo, 62.
 — Eagle, 62.
 — Eared, 62.
 — Earless, 62.
 — Eastern, 62.
 — Fasciated, 62.
 — Fern, 68.
 — Ferruginous, 62.
 — Falconine, 62.
 — Fork-tailed, 62.
 — Fasciated, 62.
 — Great-horned, 62.
 — Knocking, 62.
 — Large-beaked, 63.
 — Least, 62.
 — Little, 62.
 — Little Hawk, 62.
 — Long-eared, 62.
 — Mauge's, 62.
 — Milky, 63.
 — Mottled, 63.
 Owl, Noisy, 62.
 — Occipital, 62.
 — Pagoda, 62.
 — Pearly, 62.
 — Screech, 62.
 — Short-eared, 62.
 — Snowy, 62.
 — Sonnerat's, 62.
 — Spotted, 62.
 — Sultan, 62.
 — Sumatran, 62.
 — Supercilious, 62.
 — Tawny, 62.
 — Tengmalm's, 62.
 — Ural, 61.
 — Variegated, 61.
 — White-banded, 62.
 — White-checked, 63.
 — White-fronted, 62.
 — White-horned, 62.
 — Yellow-checked, 63.
 Ox, 54.
 — American, 54.
 — Buffalo, 54.
 Oyster-catcher, 84.
 — Pied, 84.
 PALIKOUR, 65.
 Pangolin, 43.
 — Javan, 43.
 — Long-tailed, 43.
 — Short-tailed, 43.
 Panther, 28.
 Paradise Bird, 69.
 — Golden-breasted, 69.
 — Greater, 69.
 — King, 69.
 — Magnificent, 69.
 — Papuan, 69.
 — Saaguine, 69.
 — Superb, 69.
 Parrot, 76.
 — Angola Yellow Parakeet, 77.
 — Bonneted Psittacule, 77.
 — Grey Small-tongued, 77.
 — Long-nosed Cockatoo, 77.
 — Scarlet Macaw, 77.
 Parrot Fish, 117.
 Partridge, 80.
 — Colin, 80.
 — Francolin, 80.
 — Quail, 80.
 — True, 80.
 Pauxi, 80.
 Peacock, 80.
 — Domestic, 80.
 — Japan, 80.
 — Variegated, 80.
 — White, 80.
 — Wild, 80.
 Pekan, 23.
 Pelican, 95.
 — Great, 95.
 Penelope, 80.
 Penguin, 92.
 — Patagonian, 92.
 Perch, 110.
 — Common, 110.
 Petrel, 93.
 — Berard's, 93.
 — Giant, 93.
 — Hastie's, 93.
 — Puffin, 93.
 — Swallow, 93.
 — True, 93.
 Phalanger, 33.
 — Dusky, 33.
 — Dwarf, 33.
 — Rufous-grey, 33.
 — Vulpine, 33.
 — Yellow-footed, 33.
 Pharaoh's Chicken, 60.
 Pheasant, 78.
 — Amherst's, 78.
 — Golden, 79.
 — Nepal, Horned, 79.
 — Pencilled, 78.
 Picarel, 112.
 — Common, 113.
 Pigeon, 81.
 — Bald-fronted, 82.
 — Carrier, 81.
 — Carunculated, 81.
 — Columbar, 81.
 — Common, 81.
 — Cropper, 81.
 — Dragon, 82.
 — Gallina, 81.
 — Great Crowned, 81.
 — Jacobin, 81.
 — Nun, 81.
 — Owl, 81.
 — Powder, 81.
 — Runt, 81.
 — Stock Dove, 81.
 — Turbit, 81.
 — Waalia, 82.
 — White-headed, 81.
 Pintado, 79.
 — Coraal, 79.
 — Guinea, 79.
 — Mired, 79.
 Pike, 118.
 Pipe Fish, 123.
 — Deep-nosed, 123.
 Plaice, 121.
 Plant-cutter, 70.
 Plover, 84.
 — Golden, 84.
 Plover, Long-legged, 88.
 Podge, 9.
 Polecat, 22.
 — Ermine, 23.
 — Siberian, 23.
 — Stout, 23.
 Porcupine, 41.
 — Brazilian, 41.
 — Canada, 41.
 — Crested, 41.
 — Long-tailed, 41.
 — Malacca, 41.
 Potoroo, 34.
 Potto, 9.
 Pratincole, 91.
 — Austrian, 91.
 Puff Bird, 76.
 Puma, 27.
 QUADRANGULAR-FINS, 120.
 Quails, 80.
 RACCOON, 20.
 — Common, 21.
 — Crab-eating, 21.
 Radiate Animals, 149.
 Rasse, 24.
 Rat, 37.
 — African, 41.
 — Alexandrian, 38.
 — Bandicote, 38.
 — Black, 38.
 — Brazilian, 38.
 — Brown, 38.
 — Cairo, 38.
 — Cape, 41.
 — Caraco, 38.
 — Economic, 36.
 — Indian, 36.
 — Javan, 38.
 — Martinique, 38.
 — Perchal, 38.
 — Pouched, 39.
 — Velvet, 38.
 — Water, 36.
 Rattlesnake, 105.
 — Banded, 105.
 Raven, 70.
 Ray, 121.
 — Thornback, 126.
 Razor Fish, 117.
 Red Start, 66.
 Remora, 122.
 Rhinoceros, 47.
 — African, 47.
 — Black, 47.
 — Indian, 47.
 — Keitlon, 47.
 — Kopacoba, 47.
 — Muchoco, 47.
 — White, 47.
 Robin, 66.
 Rock-cock, 65.
 — Green, 65.
 — Orange, 65.
 — Peruvian, 65.
 Rockling, 121.

- Roller, 70.
 Rook, 70.
 Roussette, 11.
 — Egyptian, 12.
 — Amplexicaudate, 12.
 — Black-faced, 11.
 — Black-headed, 12.
 — Bordered-ear, 12.
 — Common, 11.
 — Grey, 11.
 — Keraudren's, 11.
 — Kiodate, 12.
 — Masked, 11.
 — Middle, 11.
 — Pallid, 11.
 — Red-necked, 11.
 — Steel-headed, 11.
 — Straw-coloured, 12.
 — Teat-lipped, 12.
 — Woolly, 11.
 Ruffe, 111.
- SAKI, 6.
 — Black-headed, 6.
 — Fox-tailed, 6.
 — Monk, 6.
 — Red-bearded, 6.
 — Red-bellied, 6.
 — White-headed, 6.
 — Yellow-headed, 6.
 Salamander, 108.
 — Spotted, 109.
 Salmon, 119.
 — Baggit, 119.
 — Black-fish, 119.
 — Kipper, 119.
 — Red-fish, 119.
 — Serrated, 120.
 Sandpiper, 88.
 Sapajou, 5, 6.
 — White-throated, 5.
 Saury, 120.
 — Fetid, 120.
 Saw Fish, 126.
 Scabbard Fish, 115.
 Scham-scham, 33.
 Scorpion, 147.
 Screamer, Horned, 90.
 Scyrus, 114.
 Scythe-bill, 86.
 — African, 86.
 — American, 86.
 — Milky, 86.
 — White-headed, 86.
 Sea Bat, 111.
 Sea Cat, 116.
 Sea Eagle, 95.
 Sea Mew, 94.
 Sea Horse, 124.
 Sea Nettles, 150.
 Sea Pie, 84.
 Sea Rough, 112.
 Sea Sparrow-Hawk, 120.
 Sea Urchins, 148.
 Sea Woodcock, 117.
 Seal, 29.
 — Common, 29.
 — Great, 30.
 — Griffin, 30.
 — Hare-tailed, 30.
 — Harp, 30.
 — Hood-cap, 30.
 — Hooded, 30.
 — Leporine, 30.
 — Marbled, 30.
 — Monk, 30.
 — Proboscis, 30.
 — Rock, 30.
 — Rough, 30.
 — Small-tailed, 30.
 — Weddell, 30.
 — White-clawed, 30.
 — White-tailed, 30.
 Serpent, 106.
 — Bi-coloured Sea, 106.
 Sessile, 137.
 Shark, 126.
 — White, 126.
 Sheath-bill, 90.
 — White, 90.
 Sheep, 54.
 — Argali, 54.
 — Broad-tailed, 54.
 — Corsican, 54.
 — Cretan, 54.
 — Dikoi, 54.
 — English, 54.
 — French, 54.
 — Kammenoi, 54.
 — Long-legged, 54.
 — Long-tailed, 54.
 — Many-horned, 54.
 — Rikundonotsh, 54.
 — Stepoidarah, 54.
 Sheet Fish, 118.
 Shell of Infusorial Animals, 151.
 Shells of Gasteropods, 130.
 Shrew, 15.
 — American Marsh, 16.
 — Beautiful, 16.
 — Fetid or Common, 15.
 — Flaxen, 16.
 — Foster's, 16.
 — Indian, 16.
 — Masked, 16.
 — Mouse-tailed, 16.
 — Musky, 18.
 — Oared, 16.
 — Perfuming, 16.
 — Sacred, 16.
 — Short-tailed, 16.
 — Small, 16.
 — Square-tailed, 16.
 — Tuscan, 16.
 — Water, 16.
 — White-faced, 16.
 — White-toothed, 16.
 — White-collared, 16.
 Shrew Mole, 18.
 Shrike, 63.
 — Great Cinereous, 63.
 — Shrike, Bush, 66.
- Shrike, Swallow, 65.
 Singapoo, 9.
 Siredon, 108, 109.
 Skink, 103.
 Skua, 94.
 Skunk, 23.
 — Striated, 23.
 — White-tailed, 23.
 Slezep, 41.
 — Blind, 41.
 Sly Silurus, 118.
 Snake, 105.
 — Fanged, 105.
 — Fangless, 105.
 — Hooded, 106.
 — Naked, 105.
 — Rattle, 105.
 Snake Stones, 129.
 Snipe, 88.
 — Long-beaked, 88.
 Spider, 147.
 Sponge, 152.
 Spoonbill, 87.
 — Roseate, 87.
 — Slender-beaked, 87.
 — White, 87.
 Springbok, 52.
 Spring-baas, 38.
 Squirrel, 39.
 — Alpine, 39.
 — Anomalous, 39.
 — Beautiful, 39.
 — Black, 39.
 — Black-banded, 39.
 — Blackish, 39.
 — Cat, 39.
 — Clark's, 39.
 — Common, 39.
 — Congo, 39.
 — Double-banded, 39.
 — Elphinstone's, 39.
 — Flying, 41.
 — Fox, 39.
 — Golden-bellied, 39.
 — Great-tailed, 39.
 — Grey, 39.
 — Ground, 39.
 — Hudson's Bay, 39.
 — Javan, 39.
 — Leschenbault's, 39.
 — Madagascar, 39.
 — Malabar, 39.
 — Ocular, 39.
 — Plantain, 39.
 — Prevost's, 39.
 — True, 39.
 — Varied, 39.
 — White-banded, 39.
 — White-striped, 39.
 Stare, or Starling, 70.
 — Chilian, 70.
 — Common, 70.
 — Greenish, 70.
 — Louisiana, 70.
 — Magellanic, 70.
 — Pied, 70.
 — Red-headed, 70.
- Stare, Sardinian, 70.
 — Wattled, 70.
 Star Fish, 112.
 — Annular, 112.
 Starick, 93.
 Sterlet, 125.
 Stickleback, 114.
 Stork, 86.
 — American, 86.
 — Black, 86.
 — Gigantic, 86.
 — White, 86.
 Sturgeon, 125.
 — Common, 125.
 Sucker, 122.
 — Cornish, 122.
 Sneking Fish, 122.
 Suffocating Angel, 63.
 Sugar Bird, 72.
 Sultana Bird, 90.
 Sun Fish, 124.
 — Hispid, 124.
 — Oblong, 124.
 — Short, 124.
 — Striped, 124.
 Surmullet, 111.
 — Smaller Redbeard, 111.
 Swallow, 67.
 — Chimney, 67.
 — Esculent, 67.
 — Sand, 67.
 — Window, 67.
 Swallow, Shrike, 65.
 Swallow, Ternate, 69.
 Swan, 96.
 — Tame, 96.
 — Wild, 97.
 Swift, 67.
 — Black, 68.
 Swine, 48.
 — Chinese, 48.
 — Common, 48.
 — Guinea, 48.
 — Hog, 48.
 — Single-toed, 48.
 — Turkish, 48.
 Sword Fish, 114.
- TAMARY, 7.
 — Black, 7.
 — Leonine, 7.
 — Red-tailed, 7.
 — Silky, 7.
 — White-lipped, 7.
 — Yellow-faced, 7.
 Tanager, 63.
 — Bull-finch, 64.
 — Euphonous, 64.
 — Filleted, 64.
 — Jacapa, 64.
 — Shrike, 64.
 — Tactryphonous, 64.
 — Thick-beaked, 64.
 — True, 64.
 Tangalung, 24.
 Tench, 118.
- Tern, 94.
 Tetrabranchiate Molluscs, 127.
 Teyous, 100.
 Thick-knee, 84.
 Three-toothed, 124.
 Thrush, 64.
 — Rock, 64.
 — Song, 64.
 — Wood, 64.
 Tiger, 28.
 — American, 28.
 — Brazilian, 28.
 — Rimau Dahan, 28.
 — Royal, 28.
 Titmouse, 68.
 — Long-tailed, 69.
 Toad, 107.
 — Common, 107.
 — Surinam, 108.
 — Yellow-bellied, 108.
 Toddy, 73.
 — Green, 73.
 Tooth-bill, 75.
 Torsk, 121.
 Tortoise, 98.
 — Alligator, 98.
 — Common, 98.
 — Geometric, 98.
 — Indian, 98.
 — Marsh, 98.
 — Soft, 98.
 — Three-striped, 98.
 Toucan, 76.
 Tropic Bird, 96.
 Trumpet Fish, 117.
 Trumpeter, 87.
 — Gold-breasted, 87.
 Trunk Fish, 124.
 Tunny, 114.
 Tubular Mouth, 124.
 Turbot, 121.
 Turkey, 79.
 — Tufted, 79.
 — Wild, 79.
 Turtle, 98.
 — Hawk-billed, 98.
 — Imbricated, 98.
 — Radiated, 98.
 — Striped, 98.
- UMBRE, 86.
 — Tufted, 86.
- VALVES OF SHELLS, 136.
 Vanga, 66.
 — Rainbird, 66.
 Vertebrate Animals, 1-121.
 Viper, 105.
 — Black, 106.
 — Common, 105.
 — Plumber, 106.
 — Red, 106.
- WAGTAIL, 65.
 — Grey, 65.
- Walrus, 30.
 — Arctic, 30.
 Warbler, 65.
 — Dartford, 65.
 — Sedge, 66.
 Water Camel, 95.
 Water Hen, 90.
 — Black-backed, 90.
 — Dusty, 90.
 — Green, 90.
 — Green-backed, 90.
 — Purple, 90.
 — White, 90.
 Wattle Bird, 70.
 Weasel, 23.
 — African, 23.
 — Common, 23.
 — Four-toed, 24.
 — Jackash, 23.
 — Naked-footed.
 — Sarmatian, 23.
 — Striped, 23.
 — Three Striped, 24.
 — Vison, 23.
 Weaver Bird, 70.
 Weever, 110.
 — Common, 111.
 Whale, 57.
 — Mode of capture, 57.
 — Common, 57.
 — Fin, 57.
 — Pike-headed, 57.
 — Sharp-nosed, 57.
 — Spermaceti, 56.
 Wheatear, 65.
 Whiff, 121.
 Whimbrel, 88.
 White Fish, 118.
 White Rhinoceros, 47.
 — Common, 47.
 — Long-borned, 47.
 Whitethroat, 66.
 — Lesser, 66.
 Whiting, 121.
 Wolf, 25.
 Wolf Fish, 116.
 Wombat, 34.
 Woodcock, 88.
 Woodpecker, 74.
 — Downy, 74.
 — Great Black, 74.
 — Southern three-toed, 74.
 Wood Rat, 32.
 Woodscock, 23.
 Woolly Jerboa, 9.
 Wrasse, Red, 117.
 Wren, Wood, 66.
 — Yellow, 66.
 Wryneck, 74.
 — Common, 75.
- ZEBRA, 49.
 Zebra Opossum, 31.
 Zebra Wolf, 31.
 Zibet, 24.
 Zorilla, 23.



Sea-Urchin.

LONDON : PRINTED BY WILLIAM CLOWES AND SONS, STAMFORD-STREET.



THE PALLAH. Native of Africa.

K. BINSBURGH

W. H. L. L. L.

U.C. BERKELEY LIBRARY
C02629369

14 DAY USE	
RETURN TO DESK FROM WHICH BORROWED	
Tel # 642-2532	
BIOLOGY LIBRARY	
This book is due on the last date stamped below, or on the date to which renewed.	
Renewed books are subject to immediate recall.	
Due end of WINTER quarter Subject to recall after —	
Due end of WINTER quarter Subject to recall after —	
FEB 13 1975	
RETURNED TO	
MAR 23 1975	
BIOLOGY LIBRARY	
Due end of SPRING quarter Subject to recall after —	
MAY 13 1975	
LD 21-32m-3,'74 (R7057s10)476—A-32	General Library University of California Berkeley

